Smithsonian

June 1987

A Hawaiian eye scans the heavens, and bigger scopes are coming (p. 40)

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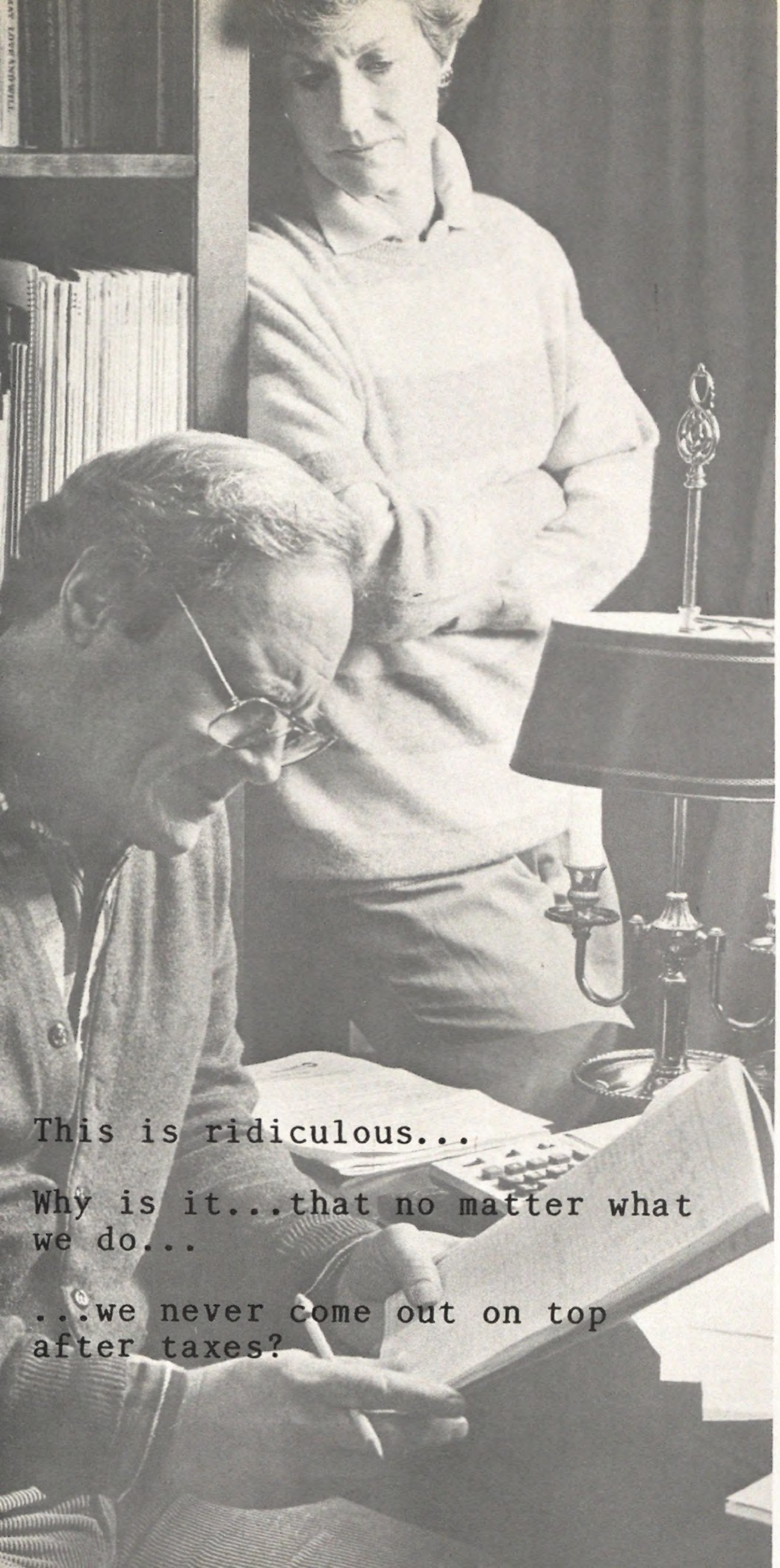

Mary and Robert Webb
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Two children

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It is a curious fact that not everyone who seeks the very best in a large sedan is fully aware of just how much sedan this entitles today's buyer to demand.

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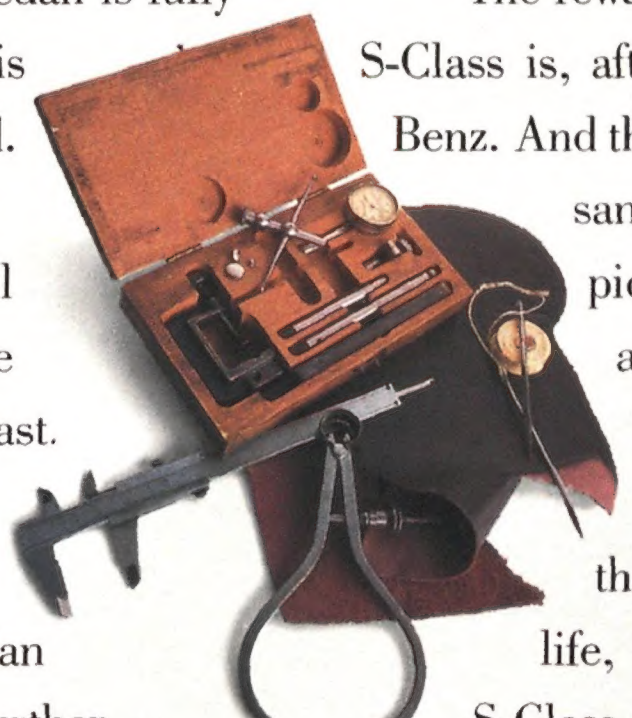

Then there are those who choose the sedans of the S-Class. The Mercedes-Benz overview is their overview: a large sedan—sufficiently well engineered—can *balance* triple-digit performance with hushed driving ease. Agile handling with an unruffled ride. The fragrance of leather upholstery and the richness of handworked woods with the tactile pleasures and keen precision of a true driver's car.

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June 1987

Smithsonian

Volume 18, Number 3

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Smithsonian (ISSN 0037-7333) is published monthly by the Smithsonian Associates, 900 Jefferson Drive, Washington, DC 20560.
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Subscription price $20 a year in U.S. possessions, $30 elsewhere.
80 percent of dues is designated for magazine subscription. Single copy price, $2.50. Second-class postage paid at Washington, DC, and additional entry points.
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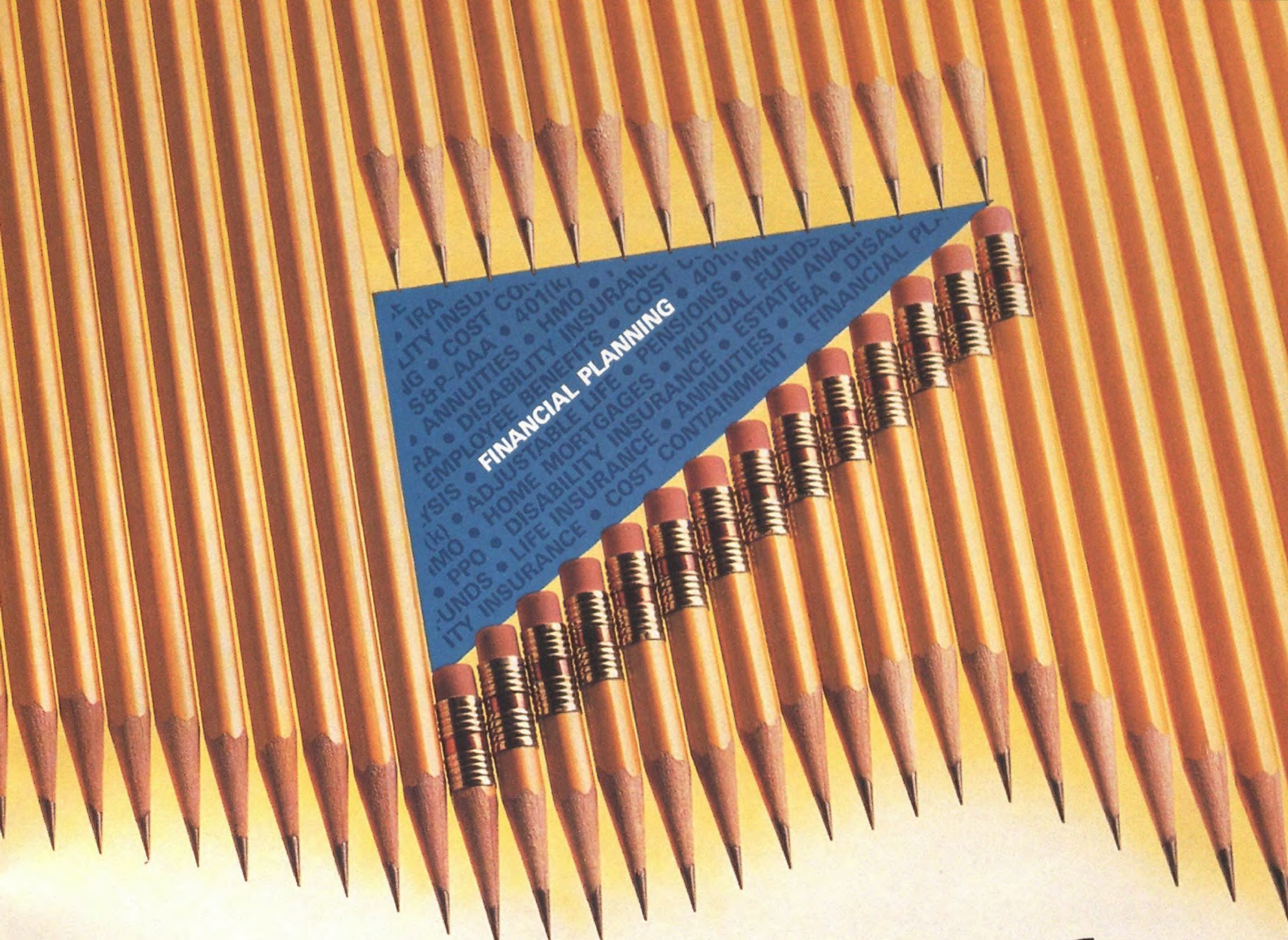

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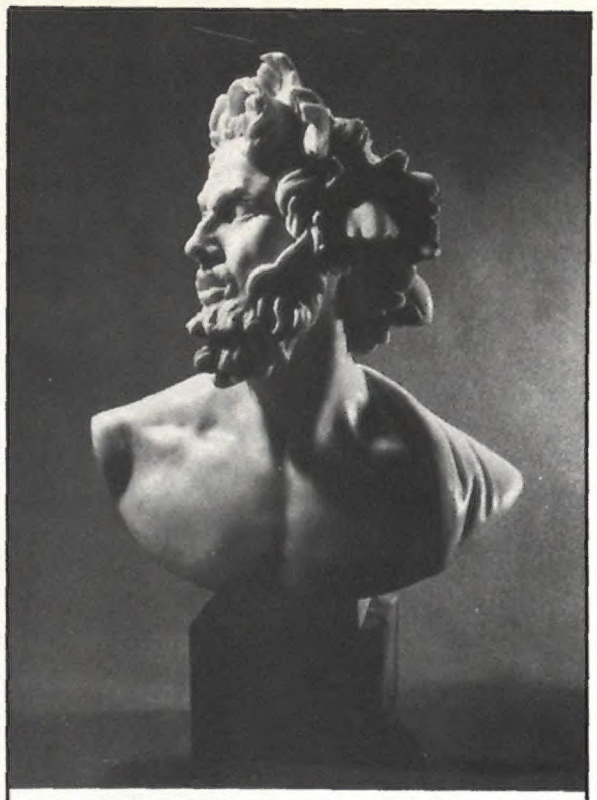

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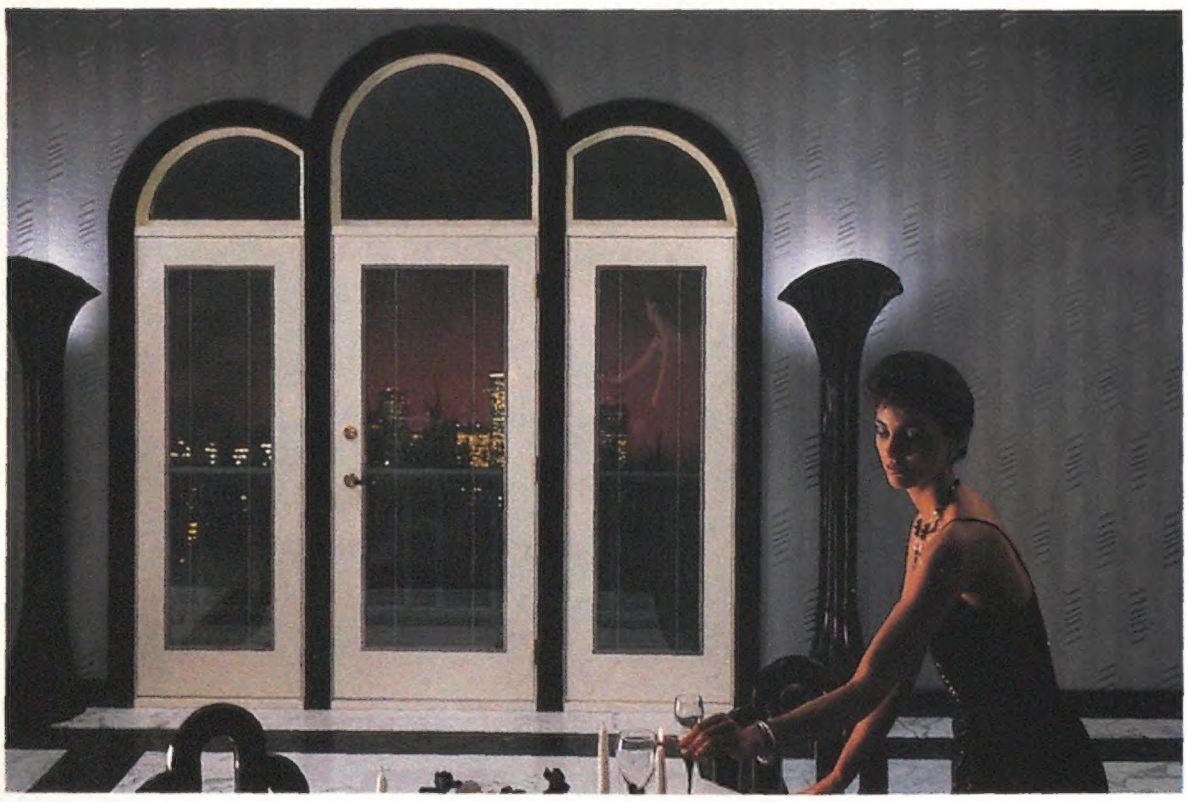

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Smithsonian horizons

Accepted notions of the family and its function have changed profoundly; how do we exhibit this in a museum?

Last March this column invited suggestions as to significant trends in our own times that deserve to be captured and preserved in the permanent collections of the National Museum of American History. The letters and comments in response have been wonderfully diverse, if difficult to summarize. Perhaps it is common human preference to argue particulars, and to avoid climbing out on exposed, higher planes of comprehensiveness or abstraction.

Sharing that preference, let me focus on only one of the major themes of change that readers identified, the American family. As an elemental building block in not only this but all other known human societies, the family's stability may easily be taken for granted. Yet it is an institution whose form and functions have changed in the past, and are in fact currently changing profoundly. The presently recognizable changes include a blurring of some characteristic features and a general attenuation in the place it occupies in our lives. Their beginnings antedate this century, and their end is not yet in sight. First-marriage rates in the United States have dramatically declined, for example, and more than half of current marriages are terminating in divorce. As a result, more than half of today's children will spend some time (an average of six years) living with a single parent. Surely this is having an effect on preferences for having children, and even on the general sentiment that women who have children should be married.

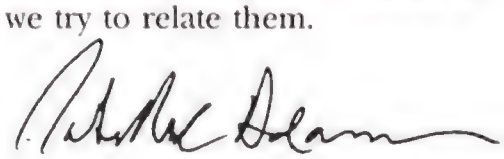
Headlines are given to the very real problem of teenage pregnancy, and to its association with single-parent families, school dropouts and poverty. But that admittedly critical problem masks a more general tendency toward postponement of parenthood, reflected in and rationalized by a pervasive cultural emphasis on mobile, unattached life-styles. The likely outcome is that around a fifth of young American women never will have children, and that fertility rates, which are already below the replacement level, will continue to decline rather than to stabilize.

The boundaries of families thus are narrowing as well as softening. Among those currently not married, there is a growing preference for residing alone rather than with other family members. Sexual relationships begin earlier, and are less confined to marriage. Cohabitation is increasingly common; while lacking the positive sanction of marriage, declining attention is paid to its difference in status. With the growing prevalence of second and third marriages, relationships among parents and offspring within the family unit more and more frequently take on new complexities and indeterminacies.

Although it is debatable which way the arrow of causality points, all these changes are clearly related to other changes in the composition of our labor force. Barely six percent of married women were employed in the United States a century ago; by a decade from now, the proportions of men and women who work should be almost equal. Is the decreasing likelihood of durable marriage a driving force, or has economic uncertainty and a widened range of consumer preferences created pressure to augment family income? Probably both, in different combinations with other factors. But the net effect is further to decrease the centrality and salience of the family as a social unit. As women's wages and occupational distributions move nearer to those of men, the trend toward equivalency in employment, and away from involvement with the family, is unlikely to be reversed.

What does this single, if obviously complex and widely ramified, focus of change imply for our Museum's collecting policies? Our successors will want to represent it somehow for future generations of visitors. One can guess that they may want to draw upon collections illustrating a whole series of new settings and cultural artifacts: efficiency apartments, singles bars, day-care centers, convenience stores, catalog shopping, frozen foods, dishwashers, microwave ovens. Beyond this, taking place at a greater distance and less conveniently symbolized by collectible objects, there are corresponding changes in the nature of the workplace, of ethnic neighborhoods and loyalties, of peer groups, of relations between sexes and generations, of avenues of mobility.

Any such list could be almost indefinitely extended. But the point is that individual collecting priorities, like the features of modern American life that ultimately they should help us to portray, are not ordinarily of intrinsic value or permanent importance. What justifies them is our understanding of the broader context of long-term change to which we try to relate them.



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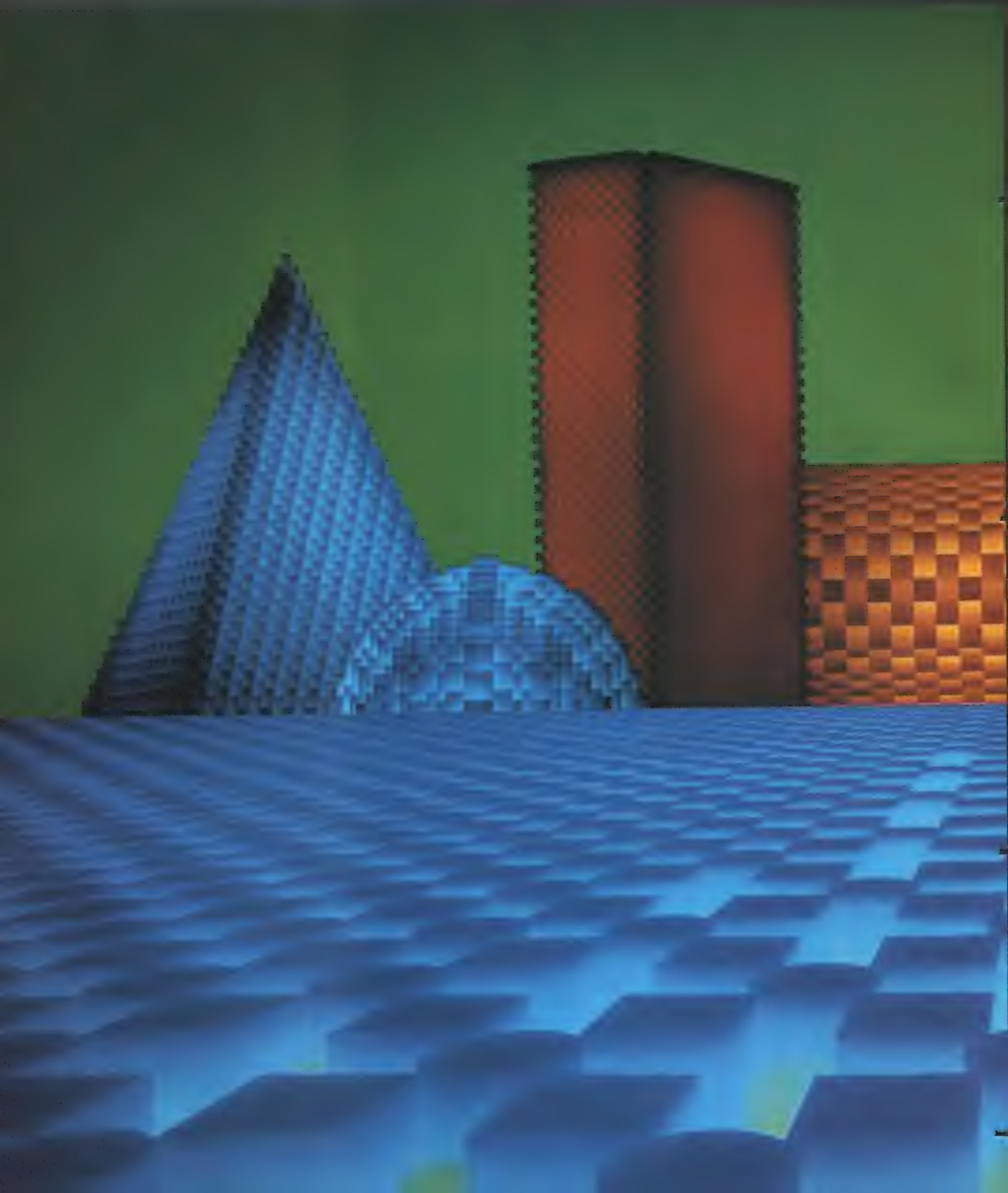

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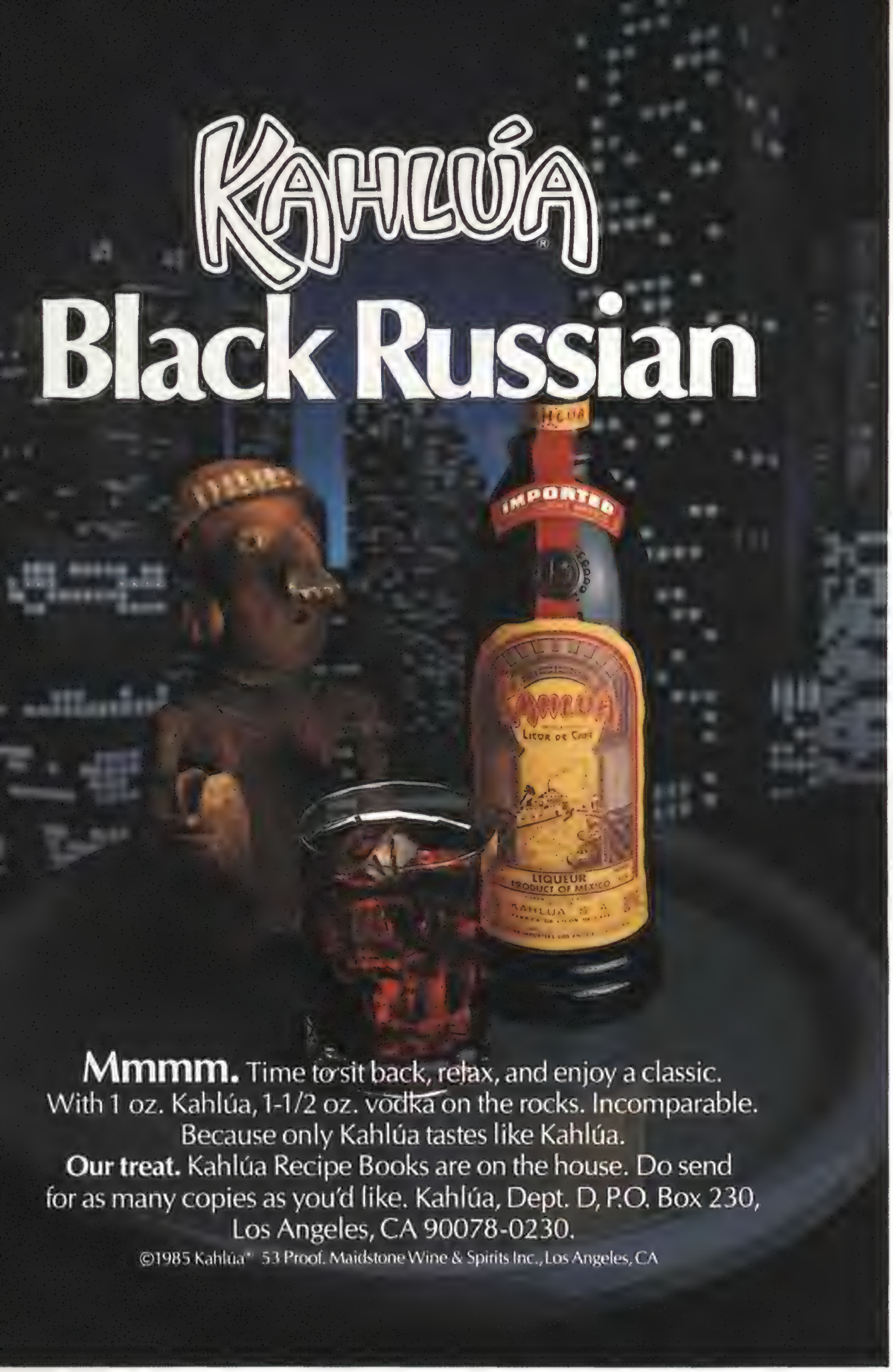
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Letters to the Editor

National Wildflower Research Center

Dear Sir: With wide-open mouth, Samson, amongst the verbena on pages 40-41 of the April issue, suggests a splendid rendition of "Samson and De-lilac" that may be a little out-a-tuna but that nonetheless demonstrates his best Paw-varotti voice. Or is it "O Sole Meow"?

At any rate there couldn't be a nicer spot to be stricken with an attack of spring fever. Samson, you got it all!

Bruno P. Janik
Longmeadow, Massachusetts

Dear Sir: As an early member of the California Native Plant Society and past president of its Santa Monica Mountains chapter, and having served on its state board, I feel qualified to take exception to Kate McKinney's opinion that in California "old-line native plant people . . . only wanted to find interesting species and make sure they were not disturbed."

Over the years many articles in *Fremontia*, the society's highly regarded quarterly journal, have urged planting of natives and publicized their availability as well as their advantages to home gardens. The San Luis Obispo chapter held a symposium on this subject and published its proceedings.

Most of our 27 chapters hold annual native plant sales, where plants in containers as well as seed may be purchased. Expert advice on planting and care is offered as well.

Nancy Dale
Santa Paula, California

Dear Sir: The "alien purple loosestrife" indeed! Having sounded the alarm five times in four pages, might SMITHSONIAN

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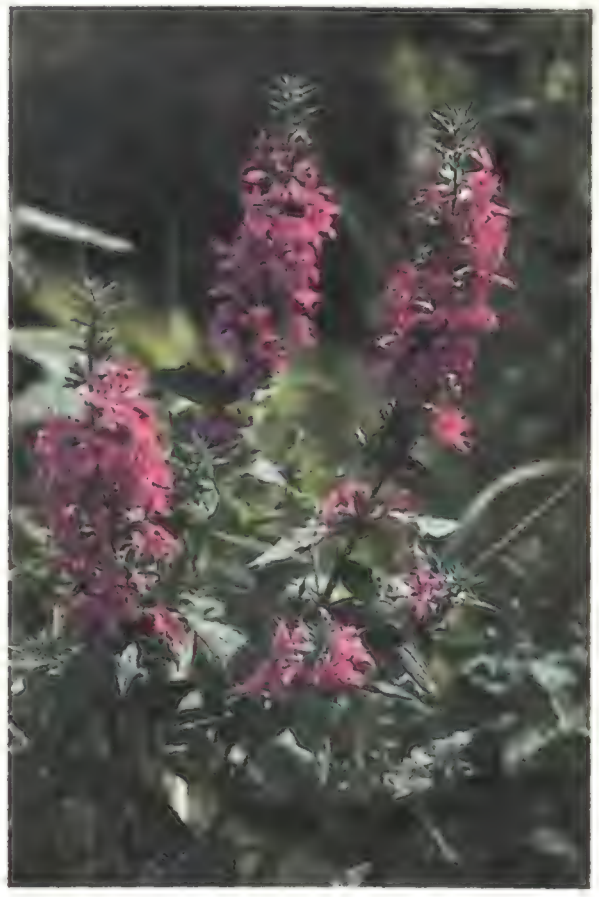
favor its readership east of the Great Plains with an identifying photograph?
Donald Dorr
Coden, Alabama
Here you are: Lythrum salicaria. *Ed.*



Dear Sir: The real difference between a wildflower and a weed lies in the eye of the beholder.
Charles M. Harris, M.D.
West Palm Beach

Baseball souvenirs

Dear Sir: Barry Halper's collection would make any baseball fan drool. But your cavalier treatment of Moose McCormick would make any baseball fan shudder.

The Moose will be remembered, not as "an outfielder in the National League for five years," but rather as not having scored the most debated run in baseball history. On September 23, 1908, at the Polo Grounds in the ninth inning of a tie game between the New York Giants and the Chicago Cubs, battling for the pennant, Moose was on third. The batter, Al Bridwell, slashed a single to center field. The Moose trotted home with the winning run. But he never scored, nor did Bridwell get a single.

Alas, Fred Merkle, who had been on first, raced for the clubhouse, not second base. As the crowd swarmed onto the field, Johnny Evers, the Cubs' second baseman, got a ball and claimed he had forced Merkle at second base, thereby nullifying McCormick's run. Confusion reigned. Conditions forced the umpires to call the game, and the League subsequently upheld Evers' claim. The teams ended the season tied.

They met on October 8 at the Polo Grounds for the championship. The Cubs won. The run the Moose didn't score cost the Giants the pennant.
John McCormack
Dallas

Dear Sir: There is a happy postscript to Robert Creamer's story. He mentioned the autographed card I'd given Reggie Jackson that said "To Reggie, with best wishes, Babe Ruth," and how I wished I could find a card saying "To Barry, with best wishes, Babe Ruth."

A few days after the story appeared, I got a phone call from Washington, D.C.: "Mr. Halper, my name is Barry Klein." I got goose pimples; I knew what it was.

It seems that when he was a kid, during World War II, his father had a candy and stationery store in Allenhurst, New Jersey, right near Asbury Park where the Yankees trained during those years. Babe Ruth used to visit the Yankee camp and every morning he'd stop by the candy store for coffee and the *Daily Racing Form*. One day he gave young Barry an autographed baseball that said: "To Barry from Babe Ruth."

When Mr. Klein phoned me, he said none of his four daughters was particularly interested in baseball, and so he decided I should have the ball. It's now a treasured part of my collection. I don't know to whom I owe the most thanks: Barry Klein for giving me the ball, SMITHSONIAN for running the story, or Reggie Jackson, who really started the whole thing.
Barry Halper
Elizabeth, New Jersey

Victor Hugo

Dear Sir: You omitted from your list one of Hugo's major accomplishments: watercolors!

I saw seven huge rooms filled with them in an exhibition at the Petit Palais in Paris in October 1985. They were magnificent.
Ellen H. Wright
Seal Beach, California

Dear Sir: The mass recital of Victor Hugo's poetry on the occasion of his funeral in 1885 was perhaps not the greatest posthumous honor he received. The Cao Dai religion, founded in Tay Ninh

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Paul Breguette

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Province, Vietnam, in 1926, includes Victor Hugo in its pantheon of saints, among which are Pericles, Julius Caesar, Li T'ai-po, Joan of Arc, Voltaire, Jean Jaurès, Sun Yat-sen, Buddha, Lao-tzu, Confucius and Jesus. Not bad company.
Lee Bradley
Valdosta State College
Valdosta, Georgia

Dear Sir: Mr. Hofstadter grossly underestimates, among other things, *Notre-Dame de Paris* (not *The Hunchback of Notre Dame* as in most English translations). It is about a cathedral, and is a Faustian story of a priest's struggle with human urges and spiritual morals.
Denise Boneau
Chicago

Sloths

Dear Sir: In Trinidad in 1947-48, a colleague of mine had a small pet sloth. The little fellow's partly green coat led to comment that he had been in a race with the algae, and the algae had won.
Charles Maple
Wichita

Dear Sir: The very name, sloth, is derogatory. Every child learns the term early in life, when its parents complain about a slothful tendency to be lazy and careless about picking up or keeping clean. No one at the zoo crowds around the cage where a sloth resides. No one makes a cute, cuddly stuffed animal representing the sloth. They're always portrayed as unwashed, never combing their hair or seeming to groom themselves.

Your article revealed a great deal that is winning about their personalities and habits. Next time I go to the zoo I will seek out the now-liberated sloth.
Charles Abernethy
Valencia, Pennsylvania

Dear Sir: One of the bright spots of the 1960s for me was having four teenage sons who introduced me to "The Sloth Song," sung by the Brothers Four in their album *Try to Remember*. I have been smiling ever since reading your article, remembering the words: ". . . I have three toes on either foot / Or half a doz on both/ With leaves and fruits and shoots to eat / How sweet to be a sloth./ The world is such a cheerful place when viewed from upside down. . . ."
Mrs. J. J. Falbo
San Antonio

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Dear Sir: When my seniors of the Class of '87 at W. T. Woodson High School studied the literature of the Middle Ages, we discussed Sloth as one of the Seven Deadly Sins.

Then came your article, and we all loved the picture of sloths sunbathing. We would caption it "Spring Break," or better still, "Beach Week." Or, having reached the time of year when college acceptances have been received, careers are being launched and final exams are too close for comfort, "Senior Slump."

Jane S. Burfoot
Annandale, Virginia

Monte Cassino

Dear Sir: More than a thousand Ukrainian and Byelorussians are buried among the Polish soldiers at Monte Cassino.

In 1941 these heroic men had found themselves in a seemingly impossible situation. Imprisoned by Stalin, they could declare their true nationality and remain in the Siberian camps to meet an almost certain death, or they could disguise their ethnicity by asserting Polish citizenship—West Ukraine and West Byelorussia having been occupied by Poland from 1918 to 1939—and go free.

They chose the latter option, and more than 15,000 Ukrainians joined General Anders' Polish Corps, where they fought fascism in foreign uniforms, under a foreign flag.

The Ukrainian Students' Monte Cassino Committee has met with the current abbot, Bernardo D'Onorio, and has arranged an annual church service to honor the memory of Ukrainians buried there. Like the faithful Polish visitors to Monte Cassino, we, the youth of Ukrainian descent throughout the world, will not forget the young Ukrainian heroes buried at Monte Cassino.

Petro Matiaszek, Chairman
Ukrainian Students' Monte Cassino
Committee
New York City

Subway art

Dear Sir: Let Boston have its Harries and Gilliam, et al. One of the best pieces in any subway is "Masstransiscope," in the northbound Myrtle Avenue station of the B, D, N and QB trains in Brooklyn.

It was created by Bill Brand, a member of the Sarah Lawrence faculty, and incorporates 228 hand-painted frames mounted behind a series of portals. As trains pass, riders see a "moving" mural. It is a wonderful display, and just beyond it the trains move out onto the Manhattan Bridge with its spectacular view of the Brooklyn Bridge and downtown Manhattan. This ride must be the most exhilarating on mass transit anywhere.

R. K. Dillon
Brooklyn

Negative biography

Dear Sir: Driving down a dirt road on a Utah camping trip a few years ago, I came upon a sign boldly proclaiming THIS IS NOT STATE ROUTE 95.

Here was a rare opportunity. *I* could decide where I was. I was no longer limited to the confines of a road map or tourist bureau. This could be the Mike McCulley Highway to the lost city of San Grandios, the city of gold, gems and California wine. When the advantages of this type of highway sign become apparent, one will surely appear outside Salt Lake City proclaiming THIS IS NOT RENO, and at the Utah state line one will say THIS IS NOT WYOMING.

Back home, when friends asked where I'd been I'd say: "I can't tell you where I was, but I *can* tell you where I wasn't."

For this year's vacation I'm not going to South Carolina first, then I'm not going to Nebraska. I haven't been to Nebraska for years and I'm really looking forward to not being there.

Mike McCulley
Tacoma

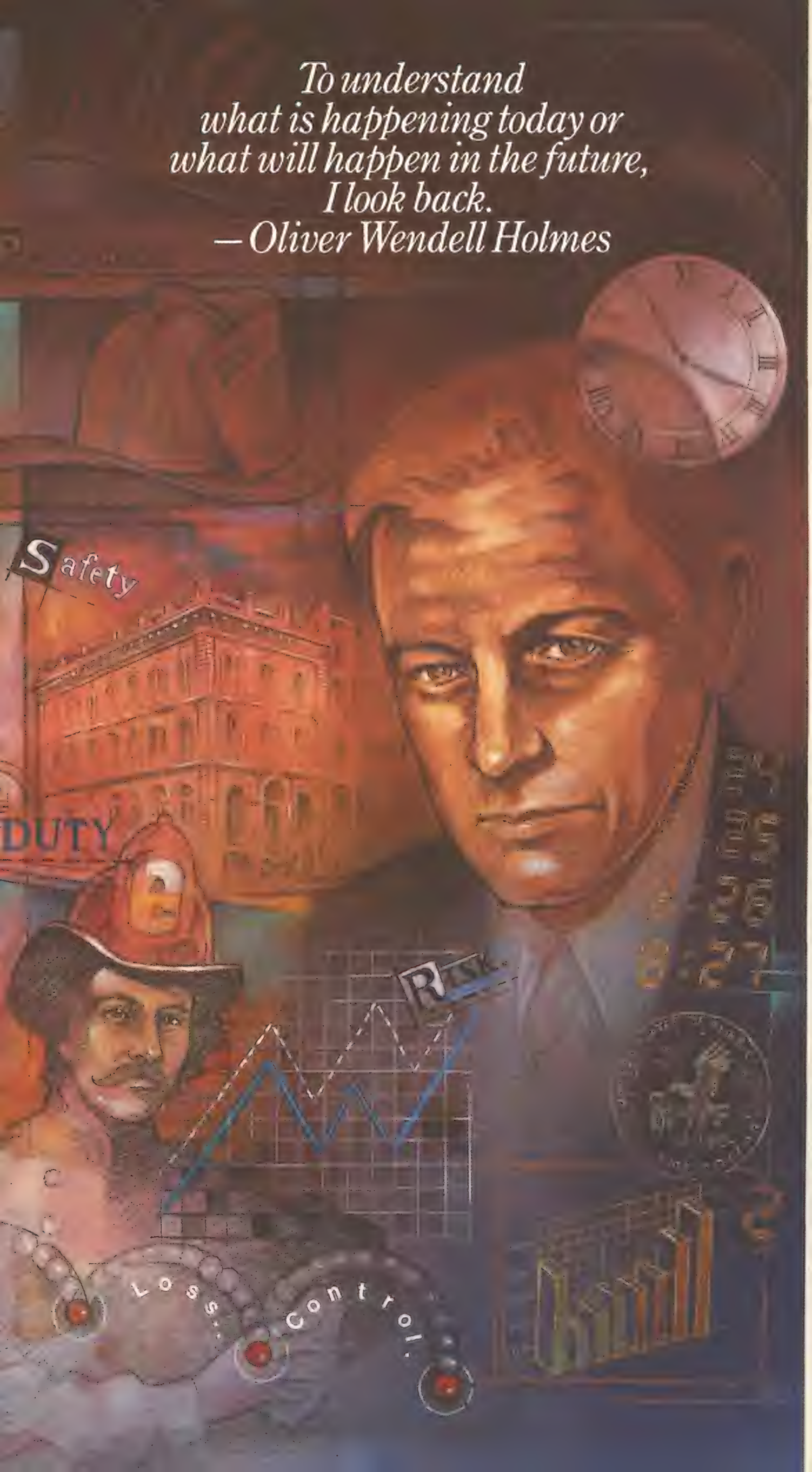
Dear Sir: My eighth grade language-arts class so enjoyed John Skow's essay that I used his idea for an autobiography assignment. Most kids had fun and did great jobs; enclosed is just one example:

"No, Terri Entzminger was not Arnold Schwarzenegger's daughter and by coincidence did not find her sister was Alyssa. She did not have Alyssa's great taste in clothes.

"Because Terri didn't win the lottery at 13 she couldn't become an artist at 13. Neither could she be an architect at 13. She'll never be a professional tennis player with perfectly straight teeth. Since she couldn't be a professional tennis player, she couldn't have met a mini-Charlie Sheen. The mini-Charlie Sheen with the same sparkling eyes, the one who did not move to the Imperial Valley and go to McCabe, then would not go on to Vincent Memorial High with Terri next year.

"Too bad she wasn't born with talent."

Alexa Horne
McCabe Union School District
El Centro, California



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Around the Mall and beyond

Zoos are strangely clannish. The inhabitants, human and otherwise, of any one particular zoo all seem to come from other zoos, to which they came from yet others, and so on through the years of their lives and the zoos of the world. Anteaters and administrators, crocodiles and curators, kangaroos and keepers often knew each other back in London, or The Bronx, or Toronto, or Taronga. So I wasn't a bit surprised to find that Jack Throp, recently retired director of the Taronga Zoo in Sydney, Australia, is a former colleague of the Smithsonian's Zoo director, Michael Robinson; is an old friend of former director Ted Reed; and would love to see Taronga have a "sister zoo" relationship with our National Zoological Park in Washington.

Intrigued with the idea, I set out to note similarities and differences. I learned that unless you relish the frustrations of Sydney traffic, the best way to get to Taronga is by ferry. At historic Circular Quay, beside Sydney Harbour Bridge, groaning under its morning load of commuters, I boarded the big half-hourly Taronga ferry, churned past the front of the Opera House, with its gleaming sail-like peaks, and then sloshed steadily down the sparkling harbor. About opposite Rose Bay, we nosed toward the North Shore, and by the time I disembarked at a massive floating dock that creaked with the tides, I had to admit that this was a lot more fun than the Connecticut Avenue bus that drops you off at our National Zoo.

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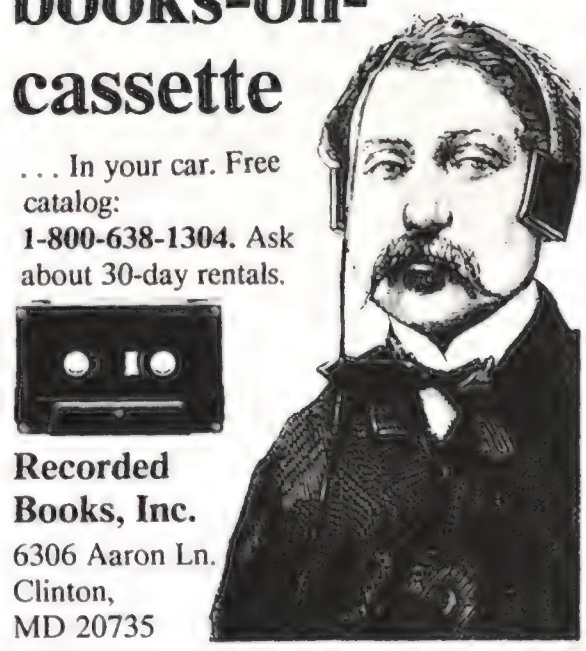

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Giraffes cavort at Taronga Zoo on hillside overlooking Sydney skyline and harbor. The Opera House is at far right.

their cable, hoisting visitors through the trees, where, as Jack Throp says, "you can see a little birdlife on the way."

I had detected an American accent when I phoned him, and sure enough, he proved to be an Arizonan—tall, slender, trimly bearded and exceedingly proud of the whole zoo. "I suppose," he said, as the two of us walked a pathway between mandrills and ostriches, "many of your Washington marsupials lived here at one time or another." If so, they were fortunate. For Taronga sprawls on a steep hillside overlooking Sydney Harbour. "Melbourne has the oldest zoo in Australia," Jack said, "and it's a wonderful place. So are the zoos in Perth and Adelaide. But we've got the choice site. We're part of Australia's oldest settlement and largest city. It's the gateway to Australia, and hundreds of animals have passed through it on their way to all the rest of the world."

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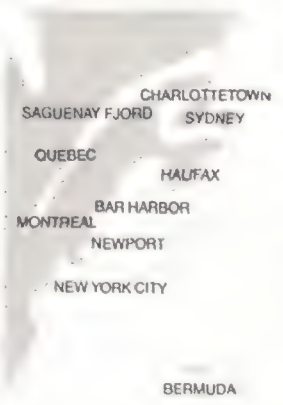

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species. But Taronga's fine breeding record makes it a much-used feeder of such animals as black rhinos, pygmy hippos, black bucks, eland, various pigeons and parrots and a number of primates.

Of these last, the chimpanzees have the best view. Their enclosure is an open hillside of rock ledges, trees and lush grass. The large sloping meadow overlooks the harbor. It gives the animals—Jack told me that there were 23 in all, an unusually large social group for a zoo—a chance to carry on their lives oblivious to human spectators.

Throp pointed out huge carp in the moat that separated us from the meadow. "They help maintain a balance in the water," he said. "We used to have two systems here, one for the moat and one for the meadow. The moat was always clean, but the meadow stream wasn't. So we linked the water systems, and now the carp take care of both."

Across the way, a keeper, a cheerful young woman of college age in a khaki uniform, was explaining chimpanzee behavior to a fascinated throng. She talked about their fashioning twigs into tools for catching ants, and she called the animals by name. Half listening, I watched an old female break off a sapling and drag it away while two youngsters tried to hitch a ride on it. The larger pushed the smaller off. The smaller retaliated with overhead slapping gestures. The old chimp looked back at the ruckus, dropped the end of the sapling in apparent disgust and knuckled her way out of sight. The talk—the zoo calls it an "animal talkabout"—ended, and the keeper greeted Jack Throp. "I hope you weren't listening," she said. "I made two goofs." I caught sight of the old chimp again. She was gazing thoughtfully at a containership footing it up the harbor toward the wharves at Woolloomooloo.

The platypuses, swimming serenely in their special exhibit at Taronga's Monotreme House, have no view at all. Neither do the wombats, bandicoots or other animals at the nearby Nocturnal House. This faintly lit environment, says Throp, has served as a prototype for many others around the world. "Most Australian mammals are nocturnal," he told me, "so it was natural for us to learn how to do this." He pointed out an echidna, looking like a big, animated sea urchin, spines protruding in all directions. Then he gestured toward a sight that would ring a bell with millions of Americans: a possum on a shingled roof that was built inside its enclosure.

Outside, we followed the Kimbu Bush Track at the zoo's Waterhole Exhibit, designed to make people feel that they are on safari. Through peepholes and narrow vistas you get mere glimpses of zoo creatures, heightening the sense of discovery. In one case you look up at a mirror and see a reflection of grazing antelope. To remind you that it's all in fun, there's a small sign: "Sidnee Tribal Chanting House." And there through the trees is a small view of the Opera House, bright under the sun.

We went into a viewing area above the tiger enclosure and looked down through floor windows. One of them was tinted blue. "The blue filter takes out yellows and greens," Jack said. "Animals are color-blind, and this is an approximation of how they'd see a tiger."

I gazed down on a mass of dark blue foliage against a paler blue ground. And then some long leaves moved, strangely, and I realized with a shock that they weren't leaves, but the stripes of a tiger. Even after seeing the move-

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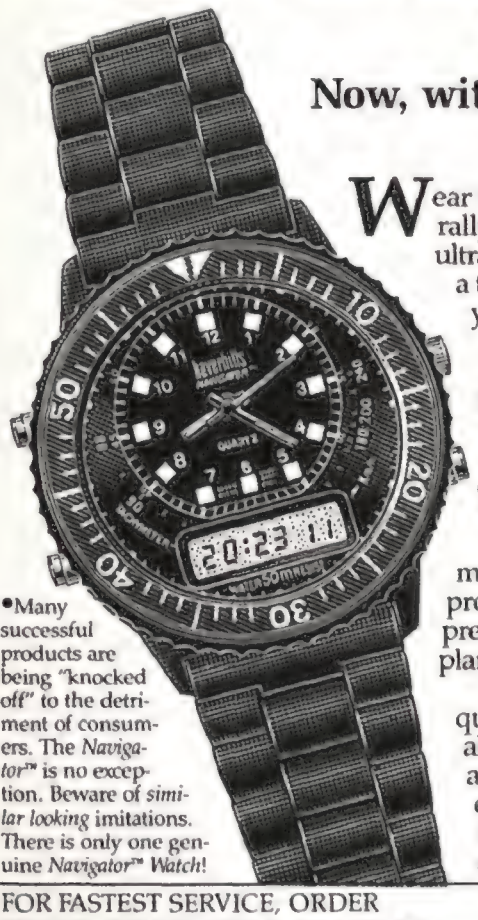

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ment, it was hard to pick out the shape of the animal against its background.

Throp is proud of such innovations, but is quick to point out that the fresh approach is a tradition at Taronga. When the zoo moved to this beautiful site from its original home in a place called Billy Goat Swamp, planners and designers wisely allowed native bush to remain around the enclosures. This was a daring step in those days (the zoo opened in 1916) when Australians still felt that their flora was pretty weird and that any place that aspired to natural beauty should not use natural gum trees and acacias, but imported trees and shrubs. Here, however, designers made full use of the shape of the land and the growths upon it, and the Taronga Zoo gained fame as an ultramodern establishment. "If Australia had such a thing as a national zoo, this would be it," says Throp.

On January 26, 1988, the fortunate zoo inhabitants who face Sydney Harbour will be able to watch a parade of tall ships, as the nation begins its bicentennial celebration. Taronga, of course, is frantically face-lifting in preparation for the big year. Old-fashioned concrete enclosures are being razed to make way for new ones; roadways built in horse-and-buggy days are being widened and beefed up to bear the weight of trucks. It's all happening in a frenzy that is utterly familiar to Americans who witnessed our own preparations for 1976.

In the midst of the construction work, the Taronga Zoo Theatre scores endless dramatic hits with its seal show. A rehearsal was going on as Throp and I passed, and I pulled up short to watch. A keeper making barely discernible hand gestures stood between two fur seals. At each slight flick of his hand, the seals instantly reacted, mounting their ladders or stools, slipping into the pool, surfacing to leap joyously into the air.

"Most animal acts turn my stomach," Jack said, "but this is different. The keeper is making a speech about seals, and people hear his voice and don't notice his gestures. So the seals seem to respond to his words. When he says they can clap their flippers, they do so, just as if they were listening too."

Suddenly both seals plopped into the water, raised a single flipper each and lay back on the surface. "This is where he's talking about how seals 'sail,'" said Jack. "They do it at sea to keep stable while they sleep and also to cool themselves. Did you see the gesture?"

"No," I said.

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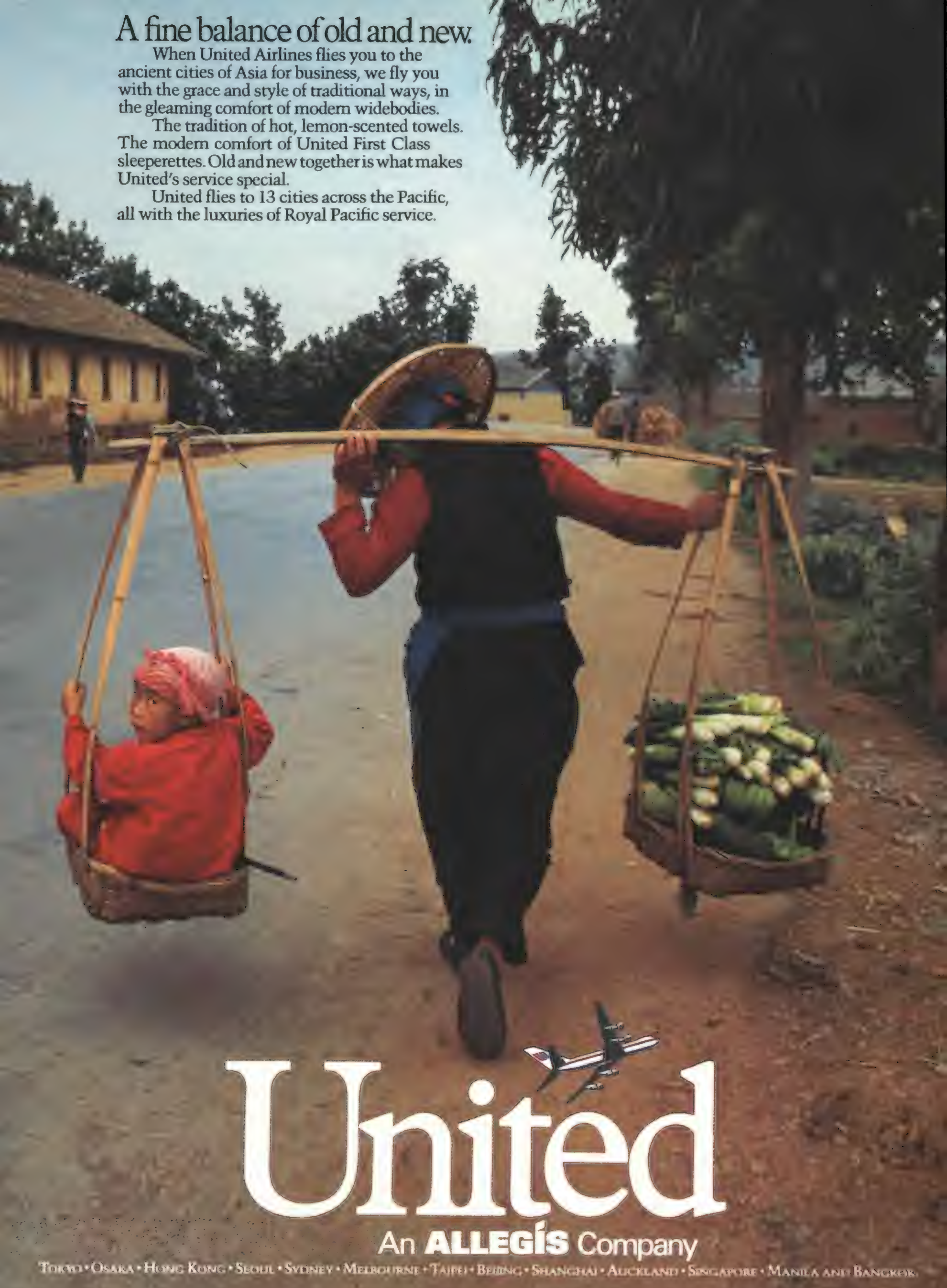

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"That's good. You're not supposed to."

He led me to a display pool where a huge leopard seal lay half asleep on the surface. "These fellows are really aggressive in nature," he said. "They feed on penguins, and they'll attack humans. They seem to think we're just big penguins. But they tolerate our keepers very quickly, allowing them into the pool and interacting with them."

One of Taronga's similarities to the National Zoological Park is its Western Plains Zoo. This is almost a twin to our Front Royal establishment, devoted to research, conservation and breeding. It's out in the country near Dubbo, New South Wales, about 300 miles away, and encompasses some 2,000 acres.

Back beside the harbor, Jack Throp still lives in the charming old director's house, for his permanent replacement hasn't been chosen. He writes books now. He's finishing one, a novel, and already has four more blocked out. One will be on a history of . . . what else? . . . Taronga Zoo. It's nice to think of it as our younger sister.

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Phenomena, comment and notes

Lunches with writers can be a succession of doors opening on new worlds; the best are as stimulating as a week's vacation

Some people go too far. When I worked at a museum magazine in New York, the guards would call from the front door every so often, saying somebody was there who had no appointment but who wanted to talk to someone on the staff. Then an excited voice would come on the line: "Hi! I'm just back from Africa and I've got 5,000 slides to show you." This opening often failed the breathless photographer, because 1) we knew the odds were against the transparencies being good enough to use, 2) likely as not we were on deadline and did not have time to look at *50* slides, and 3) there was a touch of semiconscious resentment because this person had been to Africa and we had not.

A lot of visitors, though, are worth their weight in gold. Lunches with exciting writers can be as stimulating as a quick vacation, a minisabbatical. It is like having a series of private tutors explain what you have never understood, or adventurers give illustrated accounts of their latest escapades for you alone, or insiders supply the real dope on what goes on in some otherwise inaccessible enterprise. For the person who has not invested the decades to become expert in one area, being an editor is a catbird seat from which to sample them all.

The job is the reciprocal of my early days on a weekly newspaper. There, in a county beginning to metamorphose from rural agricultural to exurban, being a reporter was a license to talk to anybody, not only the state police sergeant

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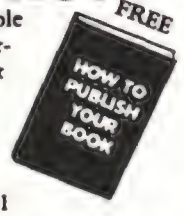

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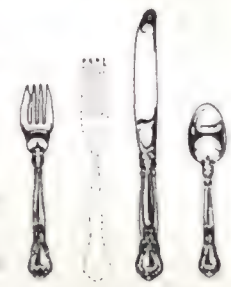

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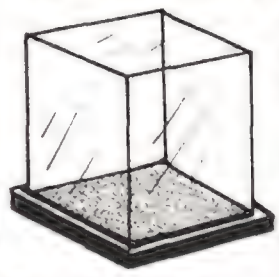

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and the fire department operator to find out where the fire was but also the taciturn old dairy farmer who was chairman of the school board. Now people come to talk to me.

One day it is a planetary scientist who doubles as a space artist, painting planetscapes we will never see, just as Albert Bierstadt and Frederick Church painted the American West for people who would never get there. He has an article in my IN box (for so long now, it occurs to me at lunch, that if he were to take out a pistol and shoot me six times, our fellow diners would come to their feet in unison and applaud). He talks of space artists, but also of the asteroidal debris that from time to time strikes the Earth without benefit of a Death Star or Planet X or some other ad hoc mechanism invoked to loose a rain of comets upon our planet. The Solar System is a pinball machine on which all the pedestals and bumpers are in motion: anything moving through it, whether the size of a brick or an apartment house or a large mountain, moves along a new path on each circuit and can always hit something it never could before.

Another day it is a National Park Service scientist, who submitted a manuscript shortly before the founding of Rome. The conversation goes from Man in the Biosphere programs in the Smokies and Adirondacks and an emerging coalition of national park associations to the history of Constantinople and the Holy Roman Empire, from the implications of a pope's ruling that Indians have souls to the political institutions we received from the "barbarians" rather than from Greece or Rome.

During lunch with a book editor we talk business, and then somehow we get around to birding and the last frontier of that participatory sport, pelagic birding—heading out into the open ocean to see who is there. I've been birding city parks; he has been going 65 miles offshore in the Gulf Stream.

A geologist turned health physicist turned filmmaker comes to town on other business. He has won awards for his films, both on the job at a national laboratory and on his own, capturing Central American archaeology. He has branched into still photography, done a book on Kenya and another on Egypt. Now he is off to Peru. He is uncomfortable traveling, prone to misadventures. I ask him why he does it. He tells me of a morning in Guatemala. He is in a pool, up to his chin in the water. The sun is just coming up, towering clouds are purple. All around him, next to his head, brightly colored birds swoop to pick insects off the water. It is for moments like this that he goes, he says.

From time to time it is a physicist, a man of infectious enthusiasms. He loves to talk about physics and astronomy, paleontology and geology, Chicago politics and Montana society. His conversation can be doubly exciting: you begin to understand specific ideas and you begin to glimpse a larger framework, the "big picture." He himself is moving in that direction—he is involved in a multibook project to summarize what an intelligent participant in Western culture should know, and he is preparing a course on the great ideas of science. One walks back from lunch jubilant, thinking that it is still possible to be a natural philosopher and—in the most general way, of course—understand life and the Universe and everything.

When I've been on vacation, I tend to come back not only rested but with new enthusiasm, new resolutions to do more

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and different things, to get into new subjects. The best lunches work the same way. They could even be quantified. A lunch that results in new ideas, new possibilities, would be set equal to one or more vacation days. One that leads to excitement and vacationlike resolutions would be rated as a one-week lunch.

When I am actually on vacation, my connection with the magazine gives me the same license that my job with the paper did. I can go talk to almost anybody about almost anything. And I'm not above pulling the "just back from Africa" gambit: "Hi! I'm in town for a couple of days and hope I can stop in." More often than not, it works.

On a quick trip to the Florida Keys last March, I stopped in Tavernier to see Alexander (Sandy) Sprunt IV, research director for the National Audubon Society. The hour was easily worth a week's vacation all by itself. He told me about the escalating effort to find out what is happening to the wading birds of southern Florida, about the reintroduction of puffins in Maine and what they can tell fishery managers, about the population boom of brown pelicans on the Texas coast and what may be a population crash in Mexico.

He also talked of the open ocean, of how little we know about seabirds in the Caribbean and the Gulf of Mexico. In the summer, Sprunt said, seabirds are abundant. But on two recent cruises, one in October from Nassau to Kingston and one in March from Cozumel to Panama, he saw almost none. No one knows where they go. We do know, Sprunt said, that some parts of the Gulf have never been studied: Chinchorro Bank off Quintana Roo in the Yucatán and, farther south, the banks off Nicaragua. It is intoxicating to know that the unknown is so close.

That old twinge of resentment is long gone. When I talk to the photographer off to Guyana or the writer looking for free-lance work while he finishes his novel in Hong Kong, I know that not only are stories coming for the magazine, but also down the road are lunches that will be one-day vacations in Guyana and Hong Kong. In the meantime I'll push farther down the road to becoming the last natural philosopher. Just as soon as I get back from counting birds at Chinchorro Bank.

John P. Wiley jr.

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PHILOSOPHICAL
TRANSACTIONS.

Opposite: Sir Isaac Newton's reflecting telescope is the prototype for today's giants. Above: Roger Angel provides the scale for successful 72-inch mirror. The honeycomb pattern beneath the smooth surface makes the mirror lighter. Behind him is a rotating oven where mirrors up to 315 inches across can be cast.

By Stephen P. Maran

A new generation of giant eyes gets ready to probe the Universe

Like runners breaking the four-minute mile, astronomers everywhere are finding ways to build telescopes once considered impossible

When I was a teenager in Brooklyn, the members of our Junior Astronomy Club rode the subway to the far reaches of the metropolis in search of viewing places away from city lights. Hurtling through the night, we would emerge from the tunnel onto elevated tracks in The Bronx, and as the train jolted along I'd practice trying to hold Venus or the Moon steady in the low-power eyepiece of a trusty 3.5-inch reflector for which I had paid all of $30. Later I graduated to a borrowed 6-inch telescope, known as Squeaky because its wooden joints creaked as they turned.

With these modest amateur tools I was able to enter a world much different from the one I had known. I could see the mountains and craters of the Moon in sharp relief, as if I were hovering above them in a spacecraft. I could see the rings of Saturn and four moons of Jupiter as they danced into new configurations each night. I could look farther into space to view the jewel box of the Beehive cluster and the batlike shape of the Great Nebula in Orion.

But there were many more things that I could not see. The night skies are aswirl with star clusters and galaxies, nebulae and the puffed-out shells of dying stars called planetaries—but even Squeaky was too small a telescope to find many of them. I determined

Photographs by Roger Ressmeyer

Michael Freeman

In Hawaii, Ken Barton uses infrared camera at left to check dome for sources of warm air currents that will degrade "seeing" for the telescope. A person and uncooled portions of floor show up on the screen.

that one day I would become a professional astronomer and work with the country's largest telescopes—and the sky, so to speak, would be the limit.

In time I did become an astronomer and did get to use several of the big sophisticated scopes—but the sky, I was to learn, still had limits. For professional astronomers, too, are restricted by the size of their equipment. The largest telescope in productive use in the United States, the 5-meter (200-inch) reflector on Palomar Mountain in Southern California (pp. 45-46), came into service nearly 40 years ago. (The "size" of a telescope is expressed in terms of the diameter of its objective lens or primary mirror. The larger the optics, the more light a telescope can collect from faint, distant objects and the better it can resolve fine detail.) For years no one seriously planned telescopes larger than Palomar in the belief that the turbulence of the Earth's atmosphere, together with the horrendous problems of engineering larger instruments, made them impractical. Now, suddenly, both obstacles appear to have been overcome: astronomers and designers are now furiously at work on a whole new generation of huge telescopes that will double and redouble our ability to see into the cosmos. Their performance will be enhanced by new technology that will vastly increase their light sensitivity. They include (pp. 47-49):

- Columbus Project, also known as the "Two-Shooter," two 8-meter (315-inch) telescopes mounted together like a pair of binoculars to give the equivalent of an 11.3-meter (445-inch) reflector. It is the work of the University of Arizona, Ohio State University, the University of Chicago, and the Osservatorio Astrofisico di Arcetri in Italy;
- W. M. Keck Observatory and Telescope, which will have a segmented 10-meter (394-inch) primary mirror, composed of 36 separate hexagonal pieces, already being built in Hawaii (pp. 52-53) by the California Association for Research in Astronomy;
- National New Technology Telescope (NNTT), a project of the National Optical Astronomy Observatories; four 8-meter telescopes mounted together like a rack of rocket launchers that combined will equal the power of a 16-meter (630-inch) telescope;
- Very Large Telescope (VLT), a European Southern Observatory design of four 8-meter reflectors, mounted in a linear array. The four telescopes will operate independently but may be used together, also equaling a 16-meter reflector.

(In this article both English and metric units are used. Most telescope sizes are nice even numbers when expressed in the units in which they were designed:

The author is a professional astronomer who writes often about the subject. He reported on servicing satellites in the August 1985 issue of SMITHSONIAN.

e.g., the 200-inch, the 4-meter. The sizes of those built in recent years are usually expressed in meters.)

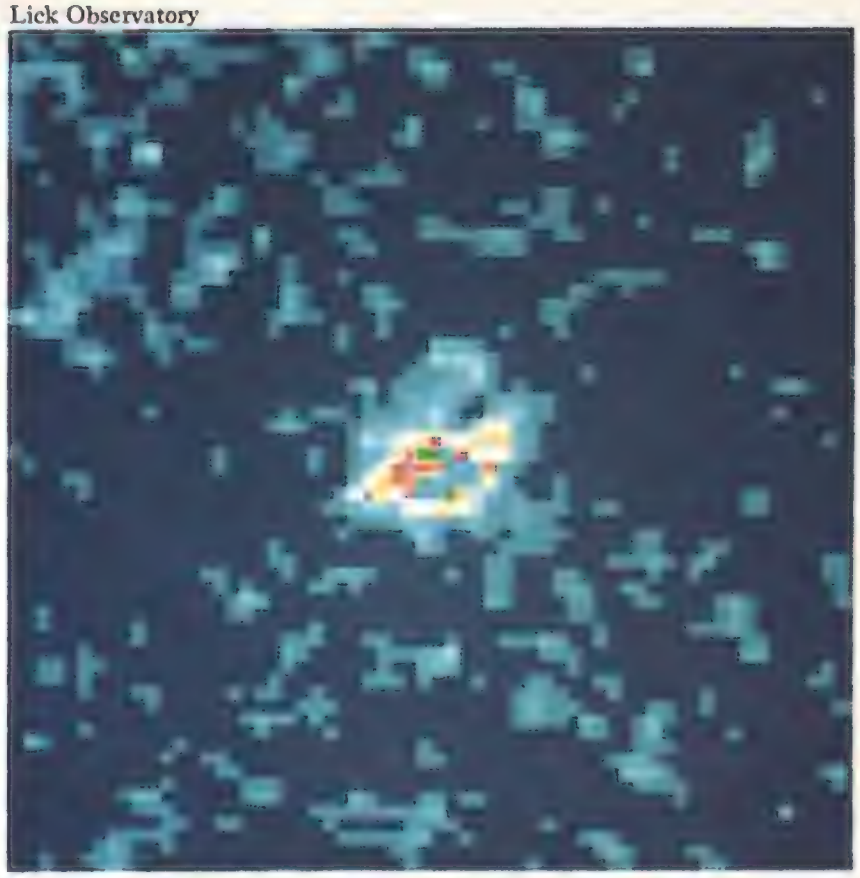
While new instruments hold the promise, almost the certainty, of discoveries undreamed of, astronomers already know many things they want to look for. Present telescopes reveal little about the most distant observable galaxies, dim smudges on our best photographs. The giant telescopes will be able to collect enough light from them to split it into spectrograms that will show the characteristic emissions and absorptions of individual chemical elements. They will determine the makeup of galaxies billions of light-years away, seen as they were early in the history of the Universe when the light rays began their long journey toward Earth. Astronomers will be able to study rapid bursts of light from the centers of distant galaxies that seem to harbor immense black holes. Working in the infrared, they will be able to detect Jupiter-size planets around any one of the five nearest stars.

Around 1610, Galileo turned one of his primitive telescopes to the smooth white band of the Milky Way and found that it consisted of "a vast crowd of stars . . . the number of small ones is quite beyond determination." He stood the world on its ear when he turned his spyglass on the heavens. He discovered the craters on the Moon, the phases of Venus, the moons of Jupiter. His telescope was a refractor—a series of lenses bent (refracted) and focused the light rays coming from distant objects. Refractors present certain insuperable difficulties. The glass of the lenses must be flawless because the light passes through them, and each surface of each lens must be accurately figured—ground to the correct curve and polished to within a few millionths of an inch of a perfect surface. Extra lenses must be added to correct what is known as chromatic aberration, since light of different colors has different wavelengths and a single lens will focus each at a different point, blurring the image. Refractors have size limits that cannot be overcome. In the largest one ever built, a 40-inch, about one-fourth of the incoming light is lost through the lenses.

Sir Isaac Newton comes to the rescue

The real father of today's giant telescopes was not Galileo but Sir Isaac Newton, who in 1668 invented a telescope that used mirrors instead of lenses (p. 40). "Seeing therefore the Improvement of Telescopes of given length by Refractions is desperate, I contrived heretofore a Perspective by Reflexions . . ." he wrote. A concave primary mirror, at the bottom of a reflecting telescope, collects light from a star or galaxy and brings all the colors to a focus at the same point. Secondary mirrors direct the light path to a desired point where it can be viewed or photographed. The quality of the

Lick Observatory



Galaxy being born is imaged (above) by an electronic sensor, a CCD, attached to a telescope. The hand (below) holds CCD, the small square inside the ring. A second CCD has been placed in the jaws of the vise at bottom and examined by microscope; its circuitry, highly magnified, is being displayed on the screen.

glass itself is not so crucial, and only one surface on each mirror has to be figured.

A century later William Herschel, a musician and expert mirror maker, built reflecting telescopes as long as 40 feet along with primaries as wide as 48 inches. On one night in 1781, he found a star that appeared as a tiny green disk; he had discovered the planet Uranus. Herschel's telescopes were famous for the remarkable clarity of their views. According to his records he was able to magnify images as much as 6,450 times on at least two occasions. He used his telescopes not in observatories but in open fields, a fact that in retrospect has turned out to be very important.

Both kinds of telescopes were built during the next 120 years, but by the turn of this century reflectors became the telescopes of choice. The largest refractor, at Yerkes Observatory in Williams Bay, Wisconsin, is just 40 inches in diameter and was built in 1897. But reflectors continued to grow. The 100-inch Hooker was installed on Mount Wilson, near Los Angeles, in 1917; the great 200-inch Hale Telescope went into operation on Palomar Mountain, near San Diego, in 1949.

In the 50 years since the Hale Telescope was begun (construction was interrupted by World War II), only one larger telescope has been built and it apparently has never quite lived up to expectations. The Bolshoi Alt-azimuth Telescope (BAT) near Zelenchuk in the northern Caucasus mountains of the Soviet Union (right) uses a 6-meter (236-inch) mirror which reportedly has been replaced twice. While the instrument does useful work, none of the breakthroughs of the past decade has been made there.

Excitement at every wavelength

In terms of telescope size, optical astronomy would seem to have been at a standstill. Astronomy itself has not, by any means. Radio astronomy blossomed after World War II, opening up a whole new part of the electromagnetic spectrum and giving us quasars and pulsars. Satellites followed, allowing us to examine the Universe at x-ray, ultraviolet and far-infrared wavelengths. At the same time, astronomers learned to get more and more out of their optical telescopes. Photographic plates gave way to electronic detectors—charge-coupled devices (CCDs). These are light-sensitive silicon chips. A typical CCD is a square a little less than half an inch on a side, divided into 250,000 picture elements or pixels. Light falling on the pixels causes them to build up electric charge. When an exposure is completed, the amount of light that has fallen on each pixel can be measured by its charge, and the result displayed on a screen. A CCD is thousands of times more sensitive than the human eye and hundreds more than even the fastest photographic film.

Computer controls have also made existing telescopes more effective. Measurements are made and images stored electronically, and the telescope itself is moved from target to target by the computer, all of which means a given telescope can do more in a given time. Automation did not come easily. I was involved with a 50-inch remote-control telescope in Arizona in the mid- and late 1960s. We could control the telescope from a computer room 50 miles away. Visitors were impressed by all the flashing lights, and we did successfully monitor the rapid pulsations of a star in the constellation Auriga, but the telescope also had an unfortunate tendency to point at the floor at inopportune times. The dome would close automatically if sensors detected rain, and sometimes seemingly of its own accord. We occasionally had to telephone astronomers in adjacent domes to ask if it was really raining. Later, the computer was unhooked and donated to a school.

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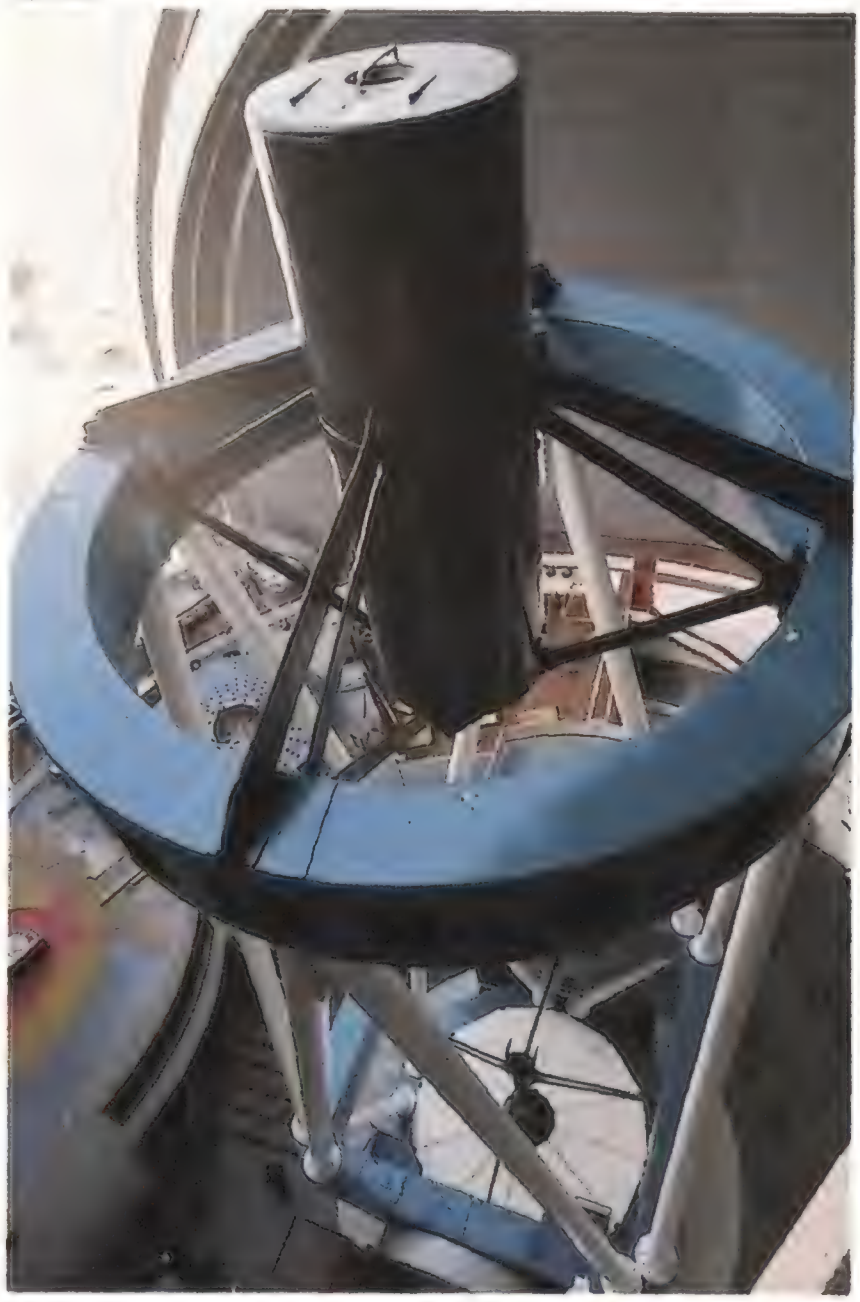
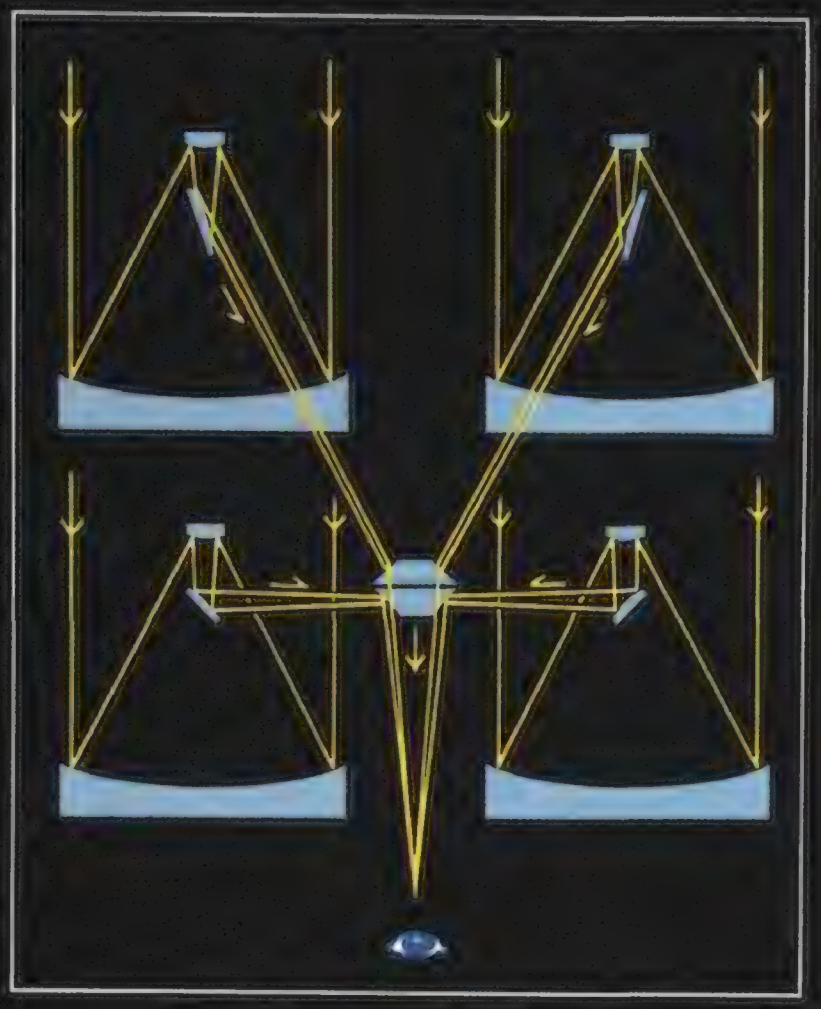
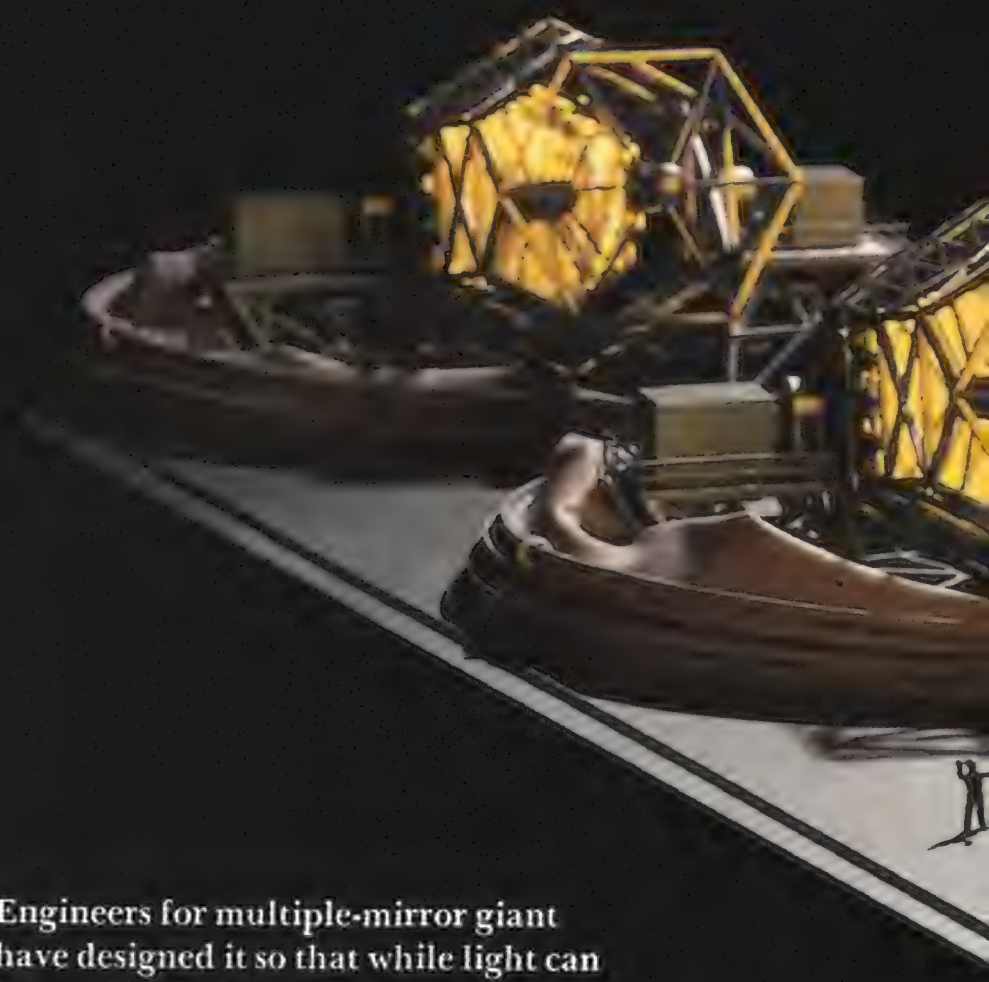


Above: The 236-inch Bolshoi Alt-azimuth Telescope in the Soviet Union remains largest in the world today. Opposite: Palomar 200-inch magically appears in a multiple exposure taken through slit as dome rotated.

National New Technology Telescope





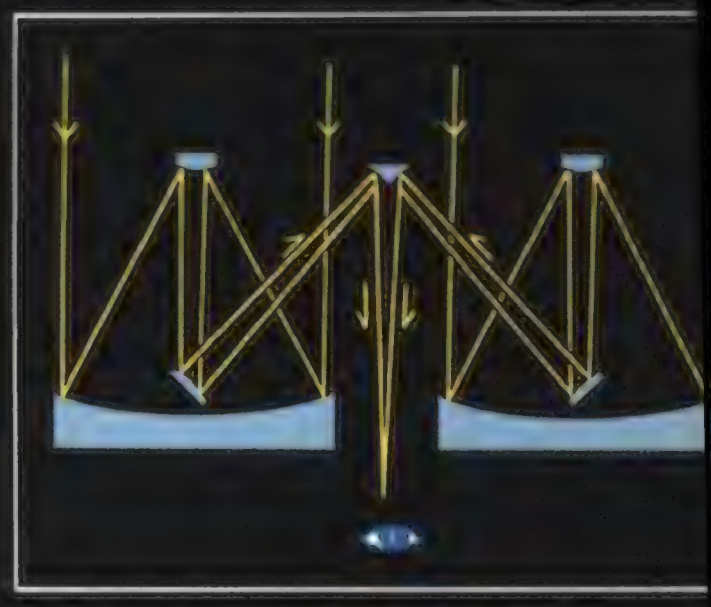
Engineers for multiple-mirror giant have designed it so that while light can be combined (left) to give more than three times the power of the 200-inch, two of the mirrors can study a distant galaxy in the visual while the other two can examine it in the infrared.

A quartet from the new generation of giant telescopes

W. M. Keck Observatory and Telescope

Figure on the deck at right gives scale for this model of the 394-inch reflector. Main mirror consists of 36 hexagons, each focusing light at same point. Diagram below shows path of light from star as it's brought to a focus behind the main mirror.

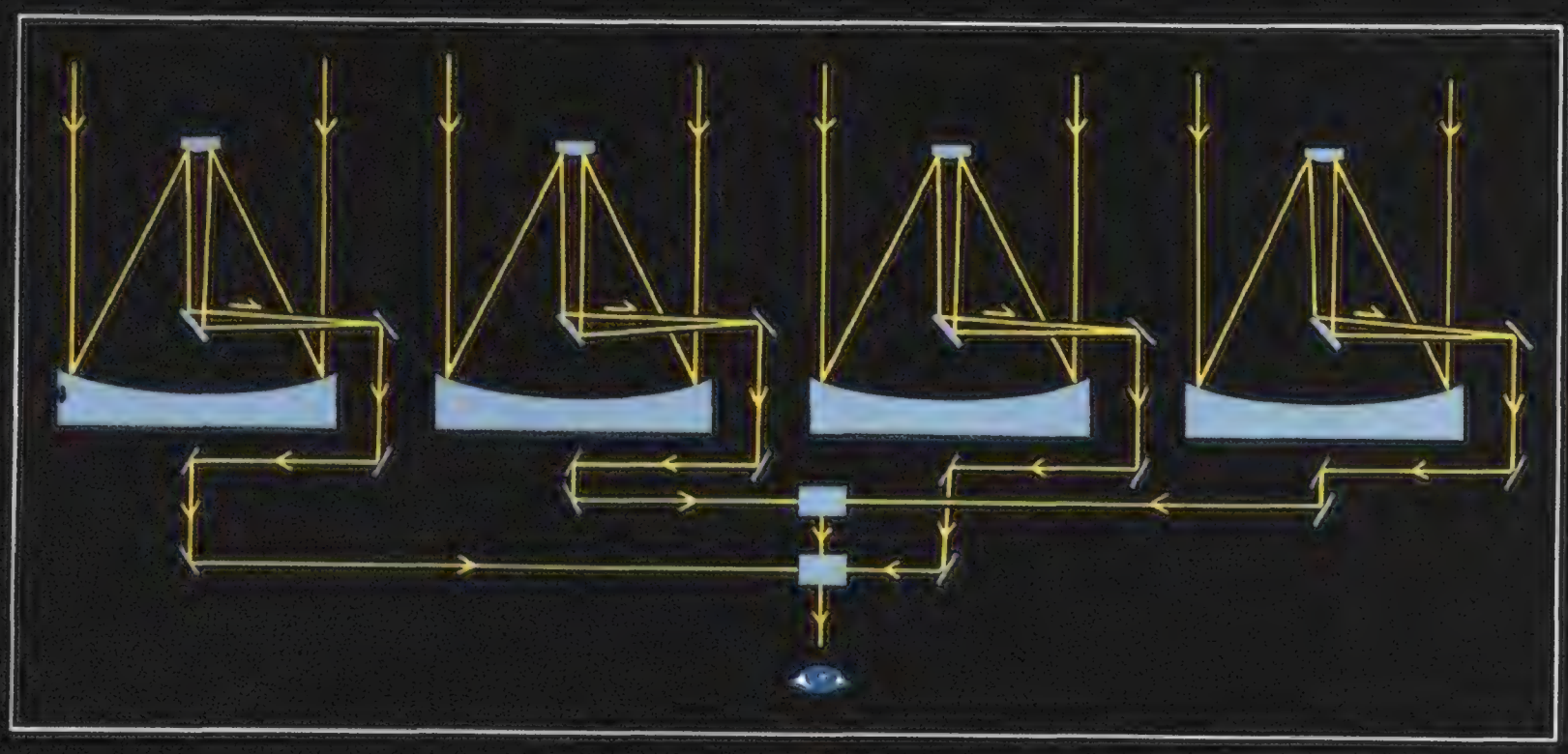
'Two-Shooter' Columbus Project



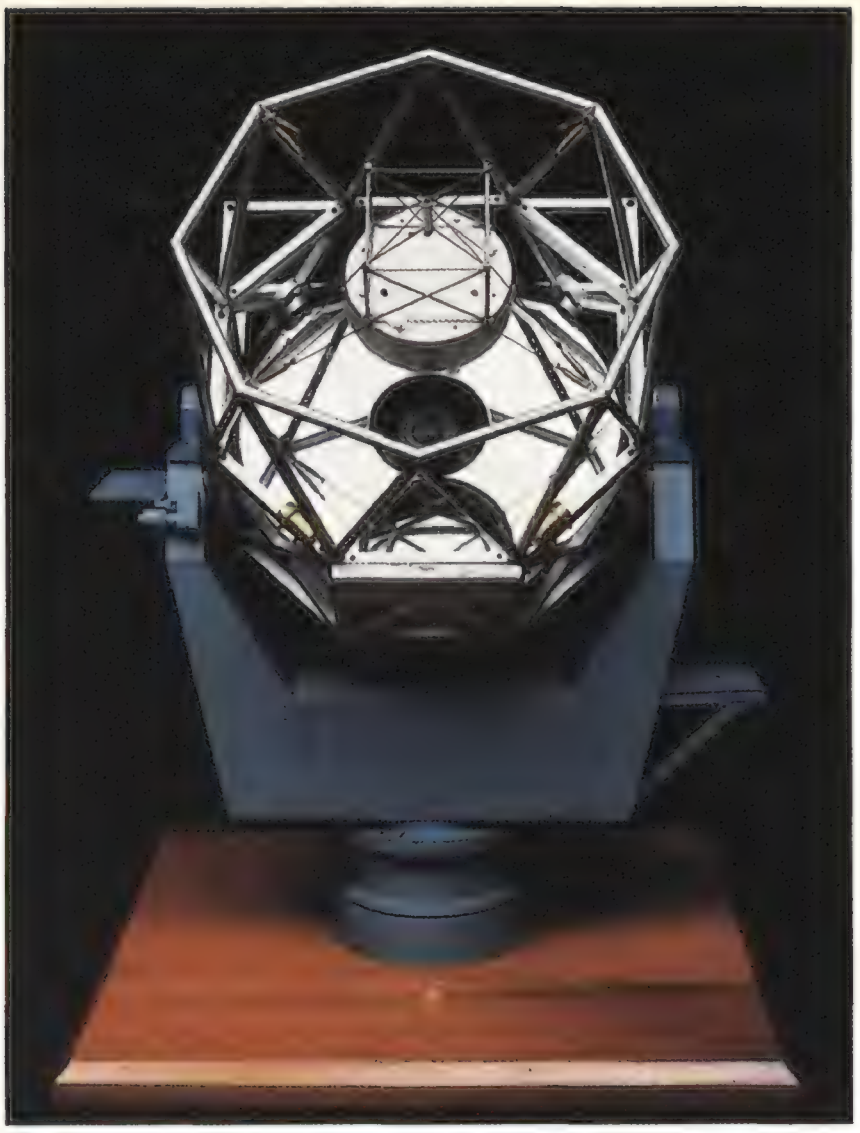
A pair of binoculars with only one "eyepiece": light striking the two 8-meter mirrors can be brought to a common focus; see diagram above. Together the two telescopes have light-gathering power and resolution of single reflector 11.3 meters across.

European Very Large Telescope

These four 8-meter telescopes can be used separately or with their beams combined, as shown below, to give same effective power as the NNTT. The designers are considering using shelters that can be folded down so the telescopes stand in open air.



In double exposure, the air currents from a flame blur Neville Woolf's left eye; Ray Shubinski watches.



Model shows how the existing MMT will look when its six 72-inch mirrors are replaced by one 256-inch.

In the years since then, however, technology has advanced and nearly all large telescopes have been automated. The days of astronomers shivering through the night at the business end of a telescope are over; no one rides in the observer's cage of the 200-inch anymore. At Kitt Peak near Tucson and on Cerro Tololo in Chile, astronomers sit in comfort in heated or air-conditioned control rooms, looking at video screens rather than through eyepieces; computers record information on magnetic tape and disks. Control rooms (opposite) rarely have windows with an outside view; on a clear night, when everyone is busy watching computers run the telescopes, an alien spacecraft could touch down and take off again and nobody would be the wiser.

New telescopes were still being built (after the Hale), and they are very effective because of their instrumentation and their locations: mountain peaks and high deserts in Australia, Arizona and Chile. Nevertheless even the largest of them, at 160 inches, is smaller than the aging telescope on Palomar. A 200-inch mirror seemed to be the practical limit because of a fundamental constraint, the atmosphere itself. The air over our heads is in constant motion, moving one way at one altitude and another way higher up. It moves up and down as it is heated by the sun and cooled by radiation. All this turbulence is why the stars appear to twinkle at night; as we look up from the bottom of an ocean of air, the moving currents disturb the beam of light coming from the star to our eyes. This "seeing," as astronomers call it, blurs images in telescopes, too. (Even with the latest improved mirror in the Soviet BAT, some of them think that the telescope is a victim of the atmosphere.)

When astronomers did begin thinking about larger telescopes 20 years ago, they thought of them for work in infrared rather than visible wavelengths. Infrared waves are longer than those of visible light and are disturbed less by atmospheric turbulence. Infrared is the best way to study the newborn stars in the dark clouds of the Milky Way. Thick dust hides the stellar infants at visible wavelengths, but infrared radiation from them cuts through dust like radar through fog.

Yet infrared has its own limitations (resolution is poor at those wavelengths, and much is blocked by water vapor in the atmosphere) and during the 1970s and '80s optical designers continued to think of ways to make larger telescopes practical. At the same time, astronomers at working observatories began to realize an astounding truth: much of the blurring in telescopes is caused by air currents in and around the instruments themselves, not in the atmosphere high above. Astronomical telescopes are very expensive and very delicate, and not long after the days of Herschel, astronomers began protecting them from the ravages of weather by placing them in buildings. As the telescopes grew larger, so did the buildings. Astronomers were never able to use the magnifications Herschel routinely employed.

Astronomers have suspected for decades that air currents inside observatory domes might have something to do with their "seeing," but somehow no one had ever looked into it. When the 4-meter (160-inch) Anglo-Australian telescope was finished in 1976, however, astronomers were disappointed in the results and began to look carefully at their telescope's immediate environment. In 1979, the new 3.5-meter (140-inch) Canada-France-Hawaii Telescope (see cover) even though built with a cooled floor to minimize warm air currents, encountered the same problems and again astronomers looked close to home.

Multiple mirrors provide the clue

The problem—and the solution—was to show up most graphically at the Multiple-Mirror Telescope on Mount Hopkins near Amado, Arizona. Operated by the University of Arizona and the Smithsonian, that telescope uses six 72-inch mirrors to achieve the effective aperture of a single mirror 176 inches across (SMITHSONIAN, May 1979). Observers there found that the blurring differed dramatically from one mirror to the next. Because it was the same atmosphere above all six mirrors, then acting director Neville J. Woolf concluded that much and even most of the blurring came from differences in air turbulence in and around the mirrors themselves. The MMT staff photographed the telescope and its surroundings with an infrared camera, the kind used to spot heat leaks in buildings. They mapped warm and cool spots, then wrapped an aluminum tape with carefully chosen thermal characteristics around much of the telescope structure and on part of the roof above. They insulated the floor of the telescope room with Styrofoam, plywood and carpeting. They minimized temperature differences that cause warm air currents to circulate. And it all worked. The seeing improved so much that on nights when the atmosphere is steady, the viewing is now limited by the quality of the mirrors, not by air turbulence. Accordingly, says MMT director Frederic H. Chaffee jr., opticians are making a seventh mirror polished to a higher tolerance to make the telescope capable of taking advantage of the improved seeing. They anticipate a ten-percent overall improvement.

Today astronomers go to extraordinary lengths to keep turbulent air out of their optical systems. Infrared cameras were used on the Canada-France-Hawaii Telescope; astronomers also placed a model of the dome in a wind tunnel to pinpoint the flow of air through it. They have since installed airlocks in the elevator and staircase so warm air cannot enter the telescope room from below, placed the electronics modules so that heat from the circuitry is directed away from the telescope tube and mirrors, and built an exhaust system that ducts warm air from the observatory out through the basement and pipes it away from the building. The results have been exceptional.

Along with the problem of turbulence, the other major obstacle to new telescope projects has been cost. Opinions differ, but a common rule of thumb has been that a telescope twice as large costs eight times as much. But new ideas are making them much more affordable. Today's designs are extremely compact. New telescopes will not be as long or as heavy as the old, which brings down their cost and the cost of the domes to house them. The primary mirrors in the giant telescopes will be more concave, so they will bring the light to a focus in a shorter distance than did the old ones. Harland W. Epps, a telescope designer at UCLA, says the new telescopes will be "short and wide like searchlights," not long and narrow like spyglasses.

Another significant cost factor has to do with the way telescopes are mounted. Because of the Earth's rotation, stars like the sun appear to move across the sky—and so rapidly that at high magnification a star can whisk in and out of a viewer's sight within a matter of seconds. Classic telescope mountings have one axis parallel to that of the Earth, so that the instrument has to be rotated on only one axis to follow a celestial object across the sky. This makes for easy tracking, but also requires tons of counterweights and elaborate, expensive mountings. Now computer controls make tracking easy even if the telescope has to be moved continuously on two axes, so new telescopes can be mounted as simply as artillery guns: the whole base rotates

Georg Fischer/Bilderberg

Today's astronomers work in control rooms. John Montgomery (left) and John McAfee run the MMT.

while the telescope itself moves up or down. These mounts are simpler, lighter and cheaper. Furthermore, the mirrors themselves will be much lighter than would be expected from simply scaling up existing mirrors. The 8-meter primaries for the VLT, a little more than 26 feet across, will be just 6 inches thick, so flexible that without precise mechanical support and adjustment they would literally flap in the breeze.

The classic way to produce the mirror for an astronomical telescope was to start with a flat blank and then laboriously grind the proper curve into it, a process that removed tons of glass and took years of meticulous work. Roger Angel at the University of Arizona has found a way to skip most of that drudgery. The basic idea is to rotate the oven in which the mirror blank is cast at just the right speed, so that centrifugal force pushes the molten glass up toward the outside of the mold. The glass already has the desired shape as it cools to the solid state. A curve of any depth, and thus a mirror of any focal length, can be made; the faster the turntable spins, the deeper the cavity.

An inveterate experimenter, Angel began working out the necessary technology for spincast mirrors by sticking Pyrex cups and bowls into a backyard kiln. The British-born astronomer, along with student John Hill, went on to build a midsize rotating oven in a former synagogue. The experiment worked well, producing a usable 72-inch mirror—but there was one drawback. The oven was controlled from a console on the turntable so that as it spun, most of the operators (or "oven pilots," as they call themselves) suffered from dizziness and nausea. In the full-size oven under the Arizona football stadium, the controls are in an adjacent, stationary room.

In the full-size oven, Angel is preparing to cast a 3.5-meter mirror for a new telescope at Apache Point near Sunspot, New Mexico, to be run by five universities as the Astrophysical Research Consortium; that mirror will be a crucial test of the spincast technique. Farther down the road is a 6.5-meter (256-inch) single mirror to replace the six smaller ones that now constitute the MMT. It not only would fit inside the present building, it would use the existing mounting and computer control system almost as is. Frederic Chaffee says that because the rotating building and the mounting already exist, the upgraded MMT could be the first giant telescope to go into operation (p. 50).

Other large telescopes are in the works. The Carnegie Institute of Washington, the University of Arizona and Johns Hopkins University have announced plans for the Magellan Project, an 8-meter (315-inch) reflector at Las Campanas in Chile. Penn State and the University of Texas are working on an 8-meter telescope that does away with three-quarters of the normal cost. This mirror consists of 73 segments arranged in a dish which in turn is mounted at a fixed tilt on a horizontal turntable. Incoming light is focused on a receiver; from there it travels to a spectrograph via fiber-optic cables. In a few years the new observatories will

The new generation is not just designs on paper; work has begun on Mauna Kea for the Keck Telescope.

begin to unlock secrets of the heavens about which we can now only guess. George Ellery Hale, the American astronomer who built the 100-inch and 200-inch telescopes, proclaimed: "Like buried treasure, the outposts of the Universe have beckoned to the adventurous from immemorial times." Soon, with a little luck and some good technology, astronomers should start to push the outposts of the Universe still farther.

In recent years, I have been studying nebulae and stars in a nearby galaxy with a NASA telescope operated remotely in high orbit. In a few years, however, I hope to work on one of the new giants, a telescope I can get my hands on (even if it really means just going from one control room to another). It's a long way from my first 3.5-inch, commercially produced Skyscope to the 10-meter Keck or the Two-Shooter, and you can't get to Mauna Kea by subway, but it is a journey well worth whatever it takes.

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CELEBRITY EUROSPORT

Whitney Museum of Art

By Robert Wernick

Jacob Lawrence: art as seen through a people's history

Lawrence today: professor emeritus of art at the University of Washington, he still paints and teaches.

Brought up in Harlem's tough and teeming streets, he encountered the fine arts in a settlement house and went on to greatness

And he said unto me, Son of man, can these bones live?

Jacob Lawrence can still hear the words of the Prophet Ezekiel thundering through the cavernous spaces of New York's Abyssinian Baptist Church from the mouth of Adam Clayton Powell sr., the great preacher of Harlem.

Harlem in the 1930s might well have struck a sensitive boy as a valley of bones. The Depression had fallen savagely on a not very wealthy economic community to begin with. Perhaps, Lawrence says, it didn't have the devastating emotional impact it had on white communities, for American blacks were used to hard times and didn't have so far to fall. Still, it was grim enough: a world of unemployment, soup kitchens, evictions, overcrowding. Jacob Lawrence was what might pass as a statistically average kid in that world. His parents had long been separated and his mother was on welfare a good part of the time. He was a high school dropout. There were only a few odd jobs available—now delivering papers, now in a laundry, now delivering bootleg liquor in brown paper bags.

A bleak enough picture, but for an imaginative, healthy, very quiet but very determined boy, it was enormously exciting. Those overcrowded streets in the West 130s and 140s were full of vivid, racy life. People were living somehow. Jake Lawrence's keen young eyes could see them bustling, stumbling, struggling everywhere, in the churches and the pool halls, the funeral parlors, the barbershops, the whorehouses.

The realities of Harlem life are fused creatively into a work of art in Lawrence's *Tombstones*, 1942.

At the age of 12 he was sent by his mother to a program at Utopia House, a settlement house where he could get hot lunches and some training in arts and crafts in the afternoon. There was a young teacher there named Charles Alston who set him to work making bright color patterns with cheap poster paints on wrapping paper; later he made papier-mâché masks, grotesque Halloween faces. He also decorated the insides of cardboard boxes to make them look like street scenes. From that time on, he knew he was going to become an artist.

There was little family encouragement. His mother had no notion of the arts and could only dream that he would grow up to get a safe job in the civil service. But the community around him provided a richly nourishing atmosphere. The great days of what had been

All: Hampton University Museum

Frederick Douglass series depicts the writer-orator in 1836, planning escape along with other slaves.

Harriet Tubman series commemorates life of the early fighter for emancipation, here as plantation worker.

called the Harlem Renaissance in the 1920s were over, but there were still distinguished figures around—novelists, poets, preachers, propagandists, who stimulated the dormant energies and desires of black America. And they were always on the lookout for signs of talent in the young. Lawrence's gifts were discovered and encouraged by people like Augusta Savage, a whirlwind of a sculptor who had come back from Paris to bring the message of art to the streets of Harlem; and his first mentor, Charles Alston, who turned his studio at 306 West 141st Street into a neighborhood workshop. The 306 studio was famous in those days. It was a gathering place and debating club for all the luminaries of the Harlem cultural world: older ones like Claude McKay, Countee Cullen and Langston Hughes; younger ones like Richard Wright and Ralph Ellison, who went there to talk and argue among themselves and with pilgrims from downtown like the young William Saroyan. Alston let Lawrence rent a corner of his studio for a small sum, and he would go

A fugitive, Douglass attends lecture by Abolitionist William Lloyd Garrison and is greatly inspired by him.

In the saga, Douglass arrives in Rochester, New York, where he edits *North Star*, the first black newspaper.

there to work and to listen to all that was discussed.

Often he would walk the 60-odd blocks downtown to the Metropolitan Museum of Art and study the Old Masters. How did those Dutchmen achieve technical feats like painting glistening drops of water on the skins of fruit? Or how did they produce the different effects of a white egg on a white tablecloth?

He painted as much as he could. The earliest Lawrences to survive date from 1936, when he was 19. They contain the ideas he had worked out for himself since the age of 12, and they also contain in embryo, or fully developed, the elements that through a long career have made him one of America's most distinguished painters. These early works can be seen in the big retrospective, containing some 150 paintings and now touring the country, which will be on view at the Dallas Museum of Art, June 28-September 6, and at the Brooklyn Museum, October 1-December 1. This exhibition was made possible by a grant from the IBM Corporation. The splendid catalog, *Jacob Lawrence, American Painter*, by Ellen Harkins Wheat provides the first comprehensive survey of the work of the artist.

These are paintings of scenes of everyday life in Harlem, life in crowded quarters, with flies and rats, frayed furniture, peeling walls, everything run-down. The young artist had obviously been looking at the works of Germans like George Grosz and Käthe Kollwitz and Mexicans like José Clemente Orozco and Diego Rivera (SMITHSONIAN, February 1986), whose searing criticisms of social injustice were widely reproduced at the time. His work, however, is his own. Where the Germans and Mexicans deal with the drama of poverty, their brushstrokes and lines come packed with indignation and invective. Lawrence, on the other hand, is calm, involved but a little ironic, sympathetic but unsparing. He was brought up in poverty and

Robert Wernick, a frequent contributor to these pages, wrote about Paul Klee in February 1987 and on Fra Angelico in the December 1986 issue.

knew it from the inside. He understood how to convey both the sordidness and the kick and vitality of life in the streets. The effect of these early Harlem scenes is very powerful, and the people who saw them the first time—like those seeing them today—found it hard to comprehend how a 19-year-old could have acquired enough mastery over his materials to achieve it. "You just have to believe that what you're doing has value, and that's it," is his own explanation.

Harlem throw rugs become art

The human figures and objects that form the subject matter of his early paintings—and many of his later works for that matter—appear as bright flat patches of color against a background of more subtle color. He likes to attribute his early fascination with color patterns to the bright throw rugs that his mother, like other Harlem mothers, used to scatter around to bring a note of gaiety into their homes. But where did he get the firm sense of design that locks all the figures into such complete and cohesive patterns?

No matter where he got them, these patterns have served the purposes of his vision ever since. One striking feature that recurs frequently is the very shallow space into which the figures and objects are crowded. He often builds his composition on a framework of strong diagonal lines. The perspective tends to be skewed so that everything is thrust forward, almost into the spectator's face, and this helps give the paintings a monumental look, though they are in actuality quite small, usually no more than 20 by 30 inches. They can also evoke the feeling of a compressed, intense, claustrophobic atmosphere, a ghetto atmosphere.

Lawrence's first work was done in poster paints because they were cheapest. He later graduated to egg tempera, casein tempera made with curdled milk, and gouache. All these are water-based paints applied on paper or on gesso-coated hardboard panels. Water is a less flexible medium than oil, but it suits Lawrence's temperament. Drying quickly, with little time for second thoughts, it calls for methodical, thoughtful work.

Lawrence's figures are drawn with great skill, but the skill is directed toward expressing an emotion rather than creating realistic individual portraits. The bodies are distorted, the faces are summary and close to caricature. When he paints pool players, they are just that—pool players—not Joe and Bill and the other guys from next door.

His style of painting lends itself to narrative, and as Lawrence early on worked out for himself, the simplest way of developing a story in art is not by trying to pack everything into a single symbolic scene but by making a series of pictures showing successive or different phases of one overall action.

Among the subjects endlessly discussed and debated at the 306 studio was the place of the Negro in the history of the Western world—a world into which he had been brutally transplanted centuries before. There were heroic figures in the past, but they were barely known; barely, if ever, mentioned in the standard histories and in the schoolbooks that were written by whites. How many people had so much as heard of Toussaint L'Ouverture? Lawrence became intrigued with the man who had led the early successful revolt of slaves against a colonial power, the one that eventually brought independence to Haiti. A few blocks from the studio, in the 135th Street branch of the New York Public Library, which then housed the world's largest collection of printed and pictorial matter on the black past in Africa and America, he devoured everything he could find on Toussaint—his struggles to educate himself, his charismatic leadership, his military campaigns, his eventual betrayal and death in a French dungeon.

It was an epic story, calling for epic treatment. Lawrence decided to portray it with a series of 41 paintings in tempera on paper, each one with an explanatory caption. He conceived the series as a single unit, each panel independent but adding to the cumulative effect of the others. First he penciled in sketches of all the scenes. Then he went over them, filling them all in one color at a time, starting with the darkest, a device that helps give a striking unity of tone to the whole.

Great figures emerge from the past

Other series followed, dealing with more exemplary figures out of the black past. There was one devoted to Frederick Douglass, the escaped slave who became a famous orator and writer for the Abolitionist movement. There was a series portraying Harriet Tubman, another slave who became the most famous and successful organizer (slaveholders put a price of $40,000 on her head) of the Underground Railroad, which guided fugitives to freedom in the North and in Canada. Like Toussaint, they were marginal figures in standard histories. As Lawrence has observed, everyone knows about Molly Pitcher and Betsy Ross, but who had ever heard of Harriet Tubman? Both Douglass and Tubman had been field hands, raised in Maryland, one of the states where it was a statutory crime to teach a slave to read and write, and Lawrence saw both stories as paeans to struggle, to Man's ability to raise himself from any depth.

Works like these, with their controlled energy and their highly personal idiom, made a strong impression on everyone who saw them. But not many people were buying art in the late 1930s. It was, Lawrence says, a turning point in his life when in 1938 he was hired by the Works Progress Administration Federal Art Proj-

Seattle Art Museum

Powerful *Square Dance* is from the *Hospital* series, based on personal experience. The patients depicted are participating in a therapeutic session. Lawrence's stay opened up whole new avenues.

Seattle Art Museum

In Munich Olympic Games poster, 1972, artist shows black athletes as they strain toward the finish line.

Going to the Apollo Theater in Harlem was a ritual for Lawrence as a boy. Here, a tribute: *Vaudeville.*

Hirshhorn Museum and Sculpture Garden

ect at $23.86 a week. He was on the Project for 18 months, and when it was over he was able to consider himself a full-fledged professional artist.

In 1941 came more turning points. In that year he married Gwendolyn Knight, an attractive and talented art student who had been a great friend for years. She was a little older and a good deal more sophisticated (she came from Barbados and had been to college).

In that year, too, he produced his first work to attract national attention. It was another major series, this time on a subject closer to home. It was called *The Migration of the Negro,* and it dealt with something that was in his blood and his own youthful experience. His mother came from Virginia, his father from South Carolina; he himself was born in Atlantic City after they settled in the North. They were part of the great movement from Southern farms to Northern cities, which began during World War I and eventually transformed the demographic and political patterns of the nation (SMITHSONIAN, May 1987). It was a movement on an epic scale, a transplantation of a whole people, on the same scale as the migration from the farms of southern and eastern Europe that had flooded into the industrial cities of the United States a generation or two earlier.

The migration within our own borders was a different sort of affair, a quiet, seething shifting like a rising river that nobody notices till it becomes a flood. It was as if the good burghers of New York had gone to bed one night and awakened to find the sleepy, respectable Dutch-speaking neighborhood called Haarlem turned into the metropolis of America's—some would say the world's—black population.

"I didn't know the term 'migration,' " Lawrence has said, "but I remember people used to tell us when a new family would arrive. The people in the neighborhood would collect clothes for the newcomers and pick out coals that hadn't completely burned in the furnace to get them started." The families all had their tales to

Hampton University Museum

Lawrence's design sense is impeccable. In spare, simple style he paints slave children tumbling on sandy shore, Dorchester County, Maryland, in 1820s, the region where Harriet Tubman was born and raised.

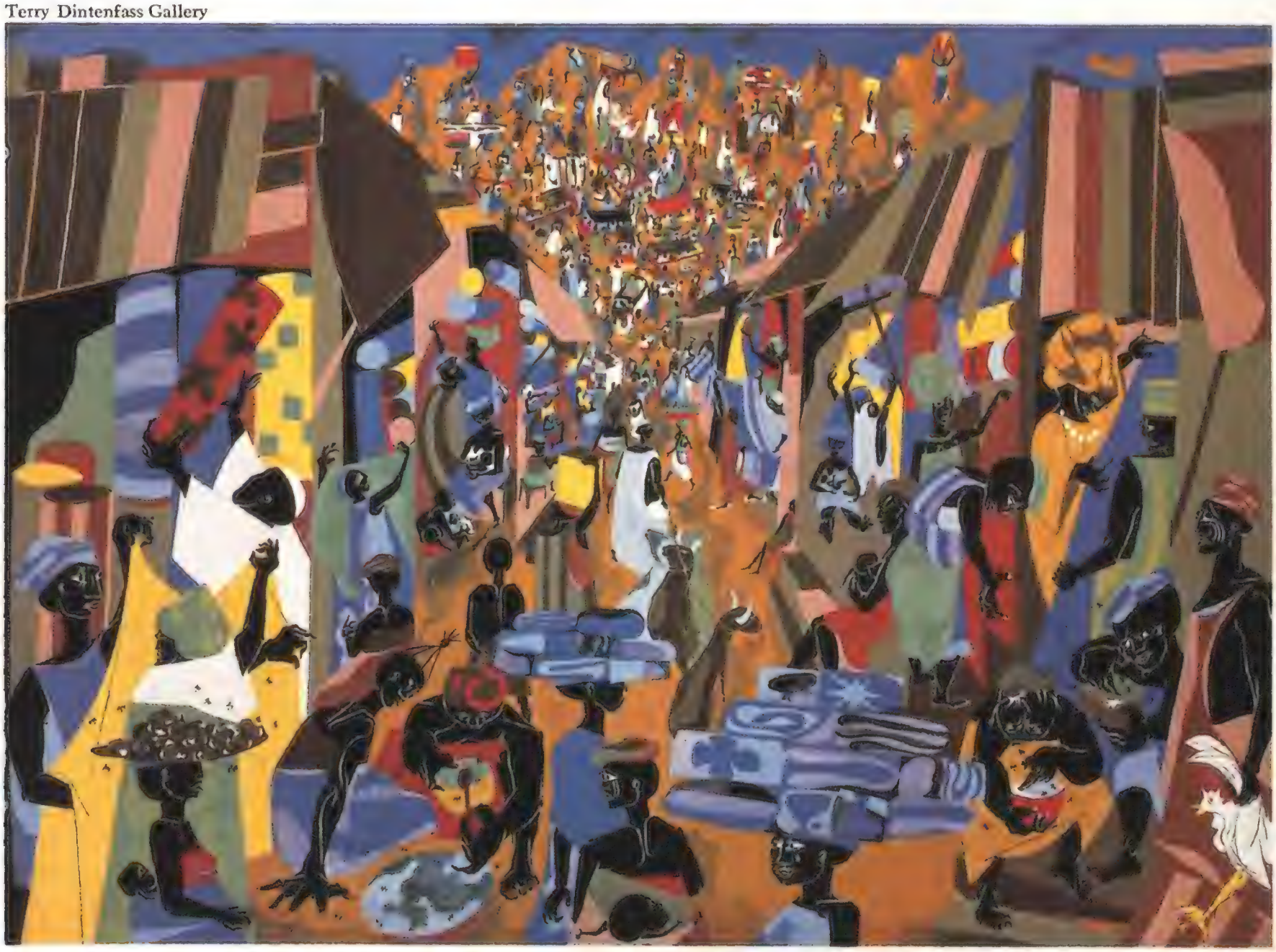
tell. Out of such bits of recollection, out of what scattered materials he could find in the library, he constructed scenes for 60 panels, again quite small (12 by 18 inches), painted like early Renaissance works in tempera on gessoed panels. The scenes constitute a panorama of social movement, from the stirrings of restlessness in the rural South, through all the hopes and jeopardies of the journey, the uncertainties of arrival in a strange new world of city streets and tenements, the new racial rivalries and riots in the North, the tensions and adjustments.

Fortune magazine reproduced 26 of the panels in its November 1941 issue. It was the first time a national publication had paid so much attention to the movement of millions of black people, or devoted so much space to the work of a black artist.

An even more important event, from Lawrence's point of view, occurred about the same time, when Edith Gregor Halpert, director of New York's Downtown Gallery, invited him to join her roster of artists, which included Ben Shahn, Charles Sheeler, Stuart Davis and other famous names. It was the first time in America that a black artist had been able to move out of the restricted world of Harlem to be represented by an important New York gallery, the kind of place where major reputations are made. Some black radicals later in the 1960s would denounce him for selling out to the white establishment. He could understand, but went right on in his own way. For Lawrence, the move to the Downtown Gallery was an immense opening up of horizons, a chance for him and for succeeding generations of black artists to enter the mainstream of American art.

The *Migration* series appeared on the gallery walls (and was at once snapped up by the Museum of Modern Art and the Phillips Memorial Gallery) two days after Pearl Harbor had thrust America into World War II. The war caught up with Lawrence in 1943, when he was drafted into the Coast Guard and given the rank of steward's mate—the U.S. Navy in those days could

Terry Dintenfass Gallery



Travel in Africa furnished new material for the artist. *Street in Mbari* in series on Nigeria shows a bustling and vivid marketplace; yet, with all of its multifarious life, painting is a triumph of design.

not envision black sailors except in menial capacities. But the good luck that has dogged his career brought him a commanding officer who appreciated his talent and eventually arranged to get him a post as a combat artist. He served for a while on a converted yacht that was doing weather patrol in the North Atlantic. It was an integrated ship, the first in the Navy in which whites and blacks were allowed to serve and live together. Later he was on a troop transport that ferried tens of thousands of troops to the battlefields and brought thousands of them back on bunks converted to hospital cots. Most of his Coast Guard paintings somehow got lost in the archives after the war. But a *War* series survives, completed a couple of years later, with some powerful scenes of the cramped, muffled, doom-laden world of the transport.

Out of the service in 1945, Lawrence found himself an established figure, almost a celebrity. His work was selling well and the critics were encouraging. He won prizes and received a Guggenheim fellowship. He was asked to do book illustrations. Black Mountain College, the experimental institution in North Carolina where many of what were to become the big names of the American avant-garde put in an appearance, asked him to teach during the summer session of 1946. It was all very gratifying for a young man from the West 130s, and even Jake Lawrence's level head began to feel askew under the pressure. He checked into a mental institution in 1949 and stayed there eight months. An intelligent doctor, constant support from Gwen, and his own incurable good sense pulled him through. Unlike most patients, he never let himself be overwhelmed by his own problems; the eyes that had looked so keenly at the streets of Harlem and the decks of the USS *General Richardson* did not blink at the Hillside Hospital in Queens. While inside, he produced the 11 paintings of a series called *Hospital*, which gives as revealing a picture of human beings in one of these institutions as we are ever likely to get. The patients sit slumped in apathy, or they stare at a table loaded with the multicolored capsules that are supposed to cure them, or they dance stiffly in a room where the columns supporting the roof have a disconcerting resemblance to the bars of a cage. They are all submerged in the gray, foreboding universe of the mentally ill.

Since he left the hospital in 1950, Lawrence's life has been a record of steady work, steady success. He has been a popular teacher at Pratt Institute in New York, at Brandeis in Massachusetts and at other schools. In 1962 he made a brief visit to Nigeria and two years later returned for an eight-month stay at the invitation of a society of local artists. The vivid colors, the bustle and animation of the marketplaces and village life of western Africa enthralled him, and for the first time in his life he felt himself out in the open spaces. He had seen the ocean when he was in the Coast Guard, but he'd been shut up in the narrow steel box of a ship. There was plenty of scenery at Black Mountain, but Black Mountain was in a South which at that time did not take kindly to the idea of a black teacher mixing in a white society, and the Lawrences spent all ten weeks there on the campus without even visiting the nearby town of Asheville.

Some changes, but the theme is constant

His style has evolved over the decades. His figures have become more angular, cubistic; "I seem to gravitate to geometric form," he says. His color combinations have become more subtle. But the basics remain the same, and while the winds of fashion have veered and sheered from Action to Hard Edge, from Pop to Minimal, he has kept steadily on his way painting the life around him. As he says, you can never run out of subjects that way.

The subject matter has broadened, though the feeling behind it has not changed. Beginning with his Coast Guard paintings, where white and black sailors together are chipping paint or cleaning bilges, he has recorded the gradual desegregation of American society. He has remained very much a part of the black community and at times has been among its most eloquent spokesmen, as in the group of paintings about the civil rights movement in the 1960s, angry paintings about prejudice and injustice. But, he says, "I never use the term 'protest' in connection with my paintings. They just deal with the social scene. They're how I feel about things."

In 1971, about the time that he and Gwen were feeling cramped in their New York quarters, he was invited to take a post as professor of art at the University

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Seattle Art Museum

Lawrence painted himself in Seattle studio, but out back window is the everlasting presence of Harlem.

of Washington in Seattle. Sixteen years later they are still there, though he has retired and is professor emeritus now. He continues to do a little teaching, for students love him—he has a gift, they say, for helping them find their own way without imposing his own personality or style on them. It is impossible to conceive of this man imposing his personal preference on anyone.

The slower, quieter pace of Seattle has had its charms for both Lawrences, though they still speak occasionally of going back to New York. They live in a pleasant house where they both have studio space. Gwen, who for almost half a century has been helping him with advice and criticism, and by sometimes rubbing down the gesso on his panels, has seen her own career bloom. She will be having a show of paintings in what he calls her romantic-realist style at a Seattle gallery next fall.

The soft gray, misty air of the Northwest has had its effect on Lawrence's painting too. The angular forms of his middle years remain, but they have become a little rounded. Far from the harsh lights of New York City, his palette has become, as he says, more tonal, less prismatic.

A recurring theme of these later years is that of builders. Lawrence has always loved a job well done and the way a good craftsman goes about doing it. He has been fascinated by tools since boyhood. He served for six months in the Civilian Conservation Corps, building a dam in upstate New York when he was 17, and he came away with an intimate knowledge of the shovel and "how it feels to throw dirt up above your shoulders." He loves the look and feel of traditional tools—the planes and chisels and awls you can see unchanged from medieval paintings of the workshop of St. Joseph the Carpenter down to our own day—and how they fit the human hand and human movement. He sees the action of builders as not only beautiful in itself but expressive of the creative depths in human nature: "I think of it as Man's aspiration, as a constructive tool—Man building." In the paintings, he blends his workers (black and white together, as you can find in real life now though not much in Lawrence's youth) and their hammers, saws, levels, and the beams and rafters of the buildings they construct in a lively complex of flat, colored shapes.

There have been other projects in Seattle, too: a huge mural, *Games,* for a sports stadium; a mural, *Theater,* for the University of Washington's performance center; a series of paintings on the settlement of the Northwest; projected murals for the state capitol building in Olympia to summarize the past and present of Washington State.

These might seem like unusual subjects for the man who once chronicled Toussaint L'Ouverture. There has been no break with the past, however; he has never forgotten where he came from. The Jacob Lawrence sketching Mount Rainier and the wilds traversed by the early settlers is the same Jacob Lawrence who frequented the poolrooms and churches of Harlem half a century ago. A few years ago, in 1977, he did one of his rare self-portraits (left). He is upstairs in Seattle, in his studio, which, characteristically, takes up more of the picture space than does the artist. It is a clean, spare, methodical studio. He is climbing the stairs into it with an ambiguous expression on his face, baring his teeth, his big capable hands extended, ready for action. In the background is a window, and where you might expect to see Mount Rainier through it, there are instead the familiar brownstones of the West 130s and 140s, squeezing the narrow streets where Jacob Lawrence first learned his trade.

Fascinated by tools and how they are used, Lawrence painted *Cabinetmaker* in homage to craftsmen.

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BUCKLE UP FOR SAFETY

By Donald Dale Jackson

Indianapolis: a born-again Hoosier diamond in the rust

Once it was called 'Naptown,' but today the wide-awake city is making a new name for itself as a national sports capital

Mayor William H. Hudnut III of Indianapolis glanced down at the notes on his desk. "How's this?" he began. "*Bue-nos di-as. May ya-mo es,* uh, *Gee-ler-mo.* No, *Gee-yer-mo.*" The accent was as flat as an Indiana cornfield, but the spirit was willing. "*Coma,* I mean, *Como say ya-mo?*" He looked up and smiled. "Yesterday all I could say was Taco Bell. I had my first lesson today. Okay—uh, *Con mu-cho gu-sto.*" He frowned in concentration. "*El gu-sto es mee-o,*" he said in conclusion.

By signing up for a six-week Spanish course, Hudnut —"Mayor Bill" to the citizens of Indianapolis who have elected him to three terms as *El Jefe*—was demonstrating both his leadership style and the singular blend of Hoosier try and savvy planning that has transformed once droopy Indianapolis into a stunning American Oz, a wonderville on the prairie. His Spanish lessons were part of the Mayor's preparation for the Tenth Pan American Games, the quadrennial Western Hemisphere sports extravaganza to be held in Indianapolis in August. The Pan Am event, in which athletes from 38 countries including Cuba and Nicaragua will compete in 27 sports, is only the latest in a series of coups brought off by wide-awake Indy.

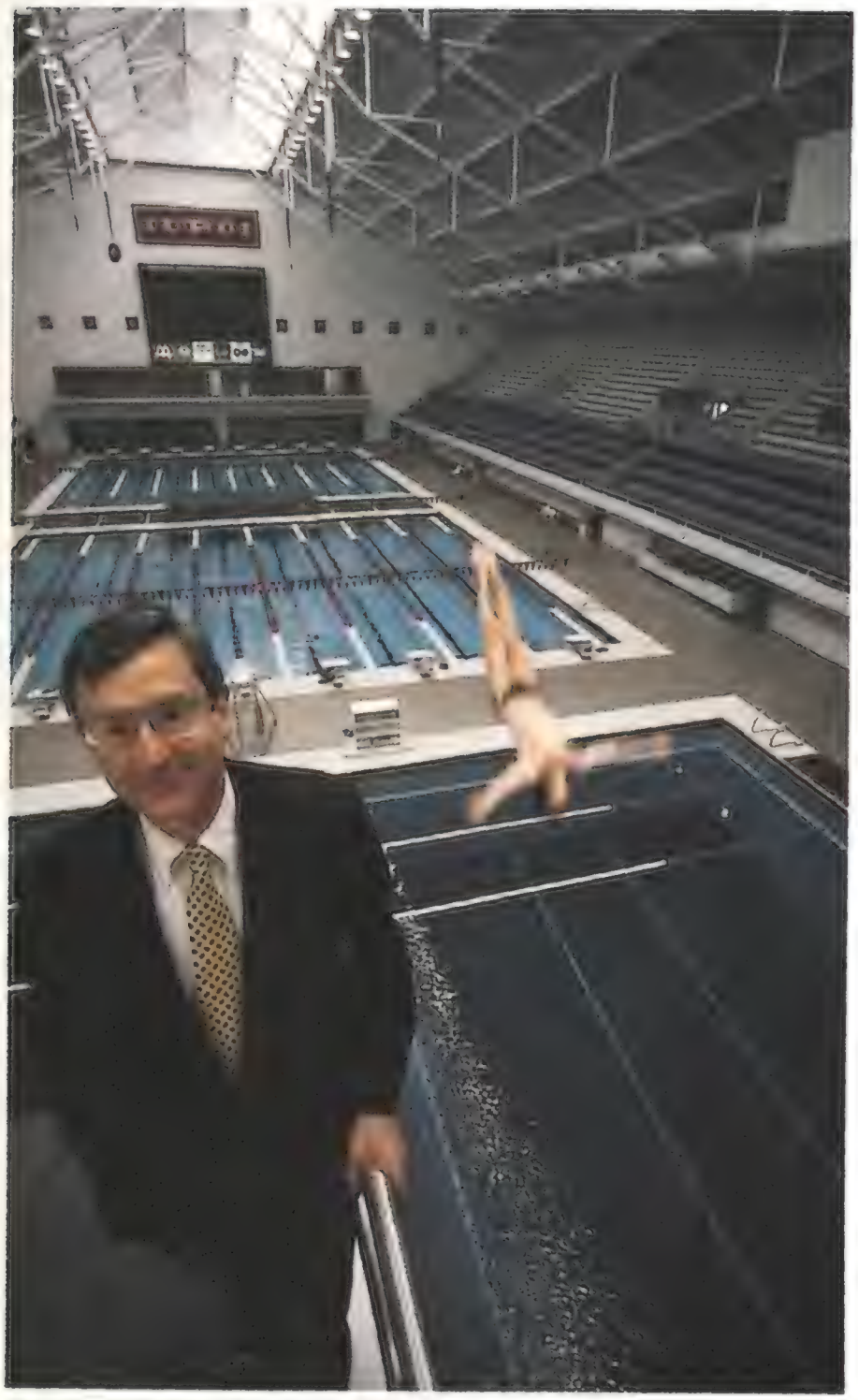
Like the city's other successes in recent years, ranging from the snaring of the former Baltimore Colts to the luring of the Hudson Institute think tank from New York and the emergence of first-flight cultural institutions, Indy's achievement in snagging the Pan Am Games came about through calculated planning and positioning. The city's leaders consciously set out to attain big-league status. When the brass rings came around, they were ready. As illustrated by the Mayor's return to the classroom, Indy also tries harder.

Not just the Mayor but hundreds of other Indy residents are studying Spanish in anticipation of the arrival of thousands of Spanish-speaking swimmers, pole vaulters, volleyball spikers and other athletes and officials. Cab drivers, policemen, waiters and others are broadening their linguistic horizons in the cause of good neighborliness; the art musem is mounting a special Latin American exhibit; the restaurant in the downtown Holiday Inn is even considering changing its lunch hours to accommodate the Latin siesta.

"We have to look at it, to make the effort," Hudnut explains, "because we're not a dynamic Sun Belt city. We have to create and manage our growth." Bill McGowan, who as president of the Indianapolis Convention and Visitors Association is the city's public relations point man, says that Indy feels compelled to fuss over its guests. "We go all out, that's what sets us apart,

Mayor Hudnut: "We're an entrepreneurial city—we take risks, build on strengths, we market ourselves."

Photographs by Enrico Ferorelli/Dot



Acrophobe Ted Boehm, head of Sports Corporation, stands high up: "Anything to further the cause."

Pan American Partners Youth Diplomat Corps members hold 38 flags for Pan Am Games countries.

and there's nothing cocky about us," he says. "We know that the phones in Boston and New York ring a lot more than ours do." Indy has to scramble.

Six months before the Pan Am Games the event's managers had already heard from more than 32,000 Hoosiers eager to work as volunteers; and $3.9 million worth of tickets had been sold, close to half the projected goal for ticket sales. Though most of the competitive venues were already in place—with its Hoosier Dome, its natatorium (left) and other arenas Indianapolis is equaled only by Los Angeles among U.S. cities as a home of world-class sports facilities—workers were plugging the few remaining gaps by readying sites for the soccer, equestrian and shooting events.

The way that the Indiana capital landed the Pan Am Games—the only other U.S. city to host the event was Chicago in 1959—is a textbook illustration of the canny mix of calculation, diplomacy and all-ahead-full hustle that Indianapolis has evolved in its drive for major-league status. "Our strategy," says Ted Boehm, an attorney who heads the nonprofit Indiana Sports Corporation, "was to apply the same skills we would

They practice in the Hoosier Dome. The total volunteer corps of 6- to 18-year-olds numbers 5,000.

use in a complex business operation to bringing major amateur sports events to Indianapolis: accounting, public relations, computer systems—with the whole works on a volunteer basis."

Opportunity beckoned when first Chile and then Ecuador withdrew from the role of host for the 1987 Games. The alert Hoosiers eyed these developments with the barely restrained avidity of a poker player holding four queens and watching his rivals fold. Indy had already captivated the U.S. Olympic Committee and emerged as the leading U.S. candidate by the time Ecuador bowed out. Mayor Hudnut, ever ready to sprint into action waving the Indy banner, led a group to Mexico City to make the city's pitch, and the selection of Indianapolis followed in late 1984.

The Pan Am coup confirmed what astute city-watchers had known for some time: Indianapolis has emerged as a strikingly successful contender in the perennial American urban sweepstakes, the jousting for recognition and visibility that can often be converted into economic gain. "Cities compete with each other all the time," Hudnut points out. "We're an entrepreneurial city—we take risks, we build on our strengths, we look for niches of opportunity and we market ourselves." The numerous admirers of Indy's victories in the urban marketplace are given to tying various belts around the city ("Star of the Snow Belt"—*Wall Street Journal*; "Cinderella of the rust belt"—*Newsweek*; "a Corn Belt city with Sun Belt sizzle"—*Chicago Sun-Times*) in stories that multibelted Indy's PR boosters tack on their office walls. But for all its self-promoting hype, which is considerable, Indianapolis is a sure-enough all-American success story, all the more impressive because of how far it came to get there.

"India-no-place" becomes someplace

Less than a generation ago Indianapolis was a dull and deteriorating city with a self-esteem problem, disparaged by natives and aliens alike as "India-no-place" and "Naptown." It was a place where the action wasn't, a cornfield-ringed metropolis with a self-perception as a good place to raise a family. It woke up once a year for the Indianapolis 500, but otherwise it was content to doze. A self-deprecating Hoosier joke told of the visitor in search of a good restaurant who was directed to Chicago. Dozens of downtown stores were boarded up in the early 1960s, and derelicts colonized the seedy warehouse district around the old Union Station. Indy was minor league all the way; it seemed fitting that its Triple-A baseball team performed at Bush Stadium.

The city slowly began to rouse in the late 1960s. The concept of "image" had entered the American vocabulary, and Indy's Chamber of Commerce became curious about how their city rated in outsiders' eyes. They commissioned a consultant to find out, but the answer was not comforting. "They said we didn't have a good or bad image, we had no image," says Sid Weedman, a onetime college professor who became a leader in the Indy revival. Amid the ensuing teeth-gnashing and stock-taking, a coalition of civic leaders called the Greater Indianapolis Progress Committee emerged, with a self-assigned mission to create something positive on the blank page that was the Indy image.

They knew they would have to do it themselves, to make it happen, because nature had not been kind to them. Indianapolis is abjectly deficient in mountains, beaches, scenic splendor or a soothing climate. Its unimposing White River, which the city's original settlers had mistakenly believed was navigable, was hardly going to lure a stampede of tourists. To halt and reverse the city's slide they had to accentuate and enhance their positives. Indy's location, for one, had always made it a crossroads—it was on the way to everywhere. Another plus was a focus on health and nutrition. The Eli Lilly pharmaceutical company was the largest homegrown business in town, and the Indiana

University Medical School was there. There was also the long-standing Hoosier infatuation with basketball and sports in general. The question was whether they could fashion something marketable out of this slender portfolio of assets.

Indy's location made it a logical convention site, so the first decision, in the late 1960s, was to build a major convention center. Next came Market Square Arena, which became the home of the National Basketball Association's Indiana Pacers. The big league, at least one big league, had arrived. Downtown Indianapolis, though still a low-voltage bulb, was finally beginning to glow a bit, albeit fitfully.

With the election of a popular Republican, Richard Lugar (now a U.S. Senator), as Mayor in 1967, the city's conservative business community had a leader they felt comfortable with. Lugar helped engineer a sweeping change in the city's governmental structure, which proved to be a major turning point for Indianapolis. In 1970 the city merged with most of surrounding Marion County into a new entity called "Unigov," which nearly doubled the population (at 710,000 it was the nation's 14th largest city in 1984) and enhanced its eligibility for federal funds. Democrats grumbled that Unigov was a formula for permanent GOP control, since the annexed suburbs were largely Republican, but businessmen saw it as the beginning of a congenial public-private partnership in downtown development—which it turned out to be.

Builders who now felt they had a friend at city hall began to remake the city's skyline. A Hilton and then a Hyatt Regency hotel went up downtown, the latter erected as part of a multibuilding complex facilitated by $4 million in city bonds. Indy's imagemakers decided that a great city needed a great center of learning and the State of Indiana obliged by creating Indiana University-Purdue University at Indianapolis (IUPUI), a new campus close to downtown which united the two leading state institutions. Down-to-earth Hoosiers promptly nicknamed the new school "Ooey-Pooey."

The beginnings of a downtown comeback and the academic infusion were gratifying, but Indy wanted more. In the mid-'70s the city leaders hit on an answer —sports. Sports was the way. Market research confirmed it: they found statistics showing that 80 percent of the American public was to some degree interested in sports. Amateur sports, especially—wholesome, healthy, competitive, a Hoosier natural, an *American* natural. "We were selling ourselves as mainstream America," Sid Weedman says.

The Indianapolis Establishment pounced on the idea ("Everyone began thinking that way," says Weedman) and buzzed into action. The headquarters of the Amateur Athletic Union had moved to Indianapolis in 1970, and Indy recruiters bearing gifts—foundation money, low-rent or no-rent office space—now began romancing the governing bodies of various amateur sports, eventually bagging the national offices for track and field, diving, gymnastics, rowing, synchronized swimming and canoe-kayak. They reasoned correctly that this would generate national events with an Indy dateline. And they also realized, as Ted Boehm has observed, that "now we had to have the hardware" —the arenas.

Seeded by money from the city, from corporations and from Indy's most munificent municipal angel, the philanthropic legacy of the Lilly family called the Lilly Endowment, the facilities began to rise. The directors of the hugely wealthy Endowment (its current assets are valued at nearly $2 billion) had made a fortuitous decision to concentrate its largess on its hometown, a second turning point for the city. Two splendid world-class venues, a track and field stadium and the natatorium, were built on the Ooey-Pooey campus before the school had a track or swimming team. A tennis complex constructed nearby became the site of the U.S. Open Clay Court Championships. A velodrome for bicycle racing materialized. Gleaming with promise, the new arenas were ready when Indy staged its first mega-event, the National Sports Festival, in 1982. Thousands of volunteers donned badges and pitched in, and the festival turned a profit for the first time.

Sandy Knapp, happy at Market Square Arena, is vice chairman of Games, official of Sports Corporation.

Former Life *writer Donald Dale Jackson lives in Connecticut, writes regularly for* SMITHSONIAN *on such diverse topics as alligators and diners.*

Roger Young works out at Major Taylor Velodrome. Young is former Pan Am Games champ and is now the competition director for cycling for coming Games. At right, Hunter Bagwell, current Indiana champion.

The strategy had delivered its first payoff, though the payee was the U.S. Olympic Committee. More important, Indy was edging its way onto the national sports map.

The event that erased any doubt about Indy's status as a big-league sports town, the shift of the Baltimore Colts pro football franchise to Indianapolis in 1984, is viewed today, ironically, as something of a civic embarrassment. The Colts' midnight move shocked Baltimore and threatened to tarnish Indy's hard-won image, and Mayor Hudnut is still at pains to avow that "We didn't steal the Colts, Baltimore lost them." Preparedness was again the Hoosier secret: with the help of another generous grant from the Lilly Endowment, the 60,500-seat Hoosier Dome was completed and in business by the time the Colts kicked off their first season in Indiana, before a sell-out crowd of season-ticket holders.

The Dome as well as the other athletic theaters and downtown projects were all built on schedule, an achievement traceable to a serendipitous agreement hammered out more than a decade ago between contractors and construction unions. With the addition of the Dome to the other arenas, the conversion of Indianapolis to a kind of permanent Wide World of Sports was complete. Judo, water polo, free-throw contests, fast-pitch softball, slo-pitch softball, archery, kayaking —you name it, Indy sells tickets to it. Hardly anyone mentions the Indy 500 nowadays; like the handsome dome on the downtown state capitol, the race has been eclipsed by newer and shinier phenomena. After the Pan Am Games the focus will shift to the Olympic track and field trials in July 1988. If Indy had a hill, it would be bucking for the Winter Olympics. "If you think a proposal won't work here," says Bill Carr, a onetime New York newspaper editor who now runs the Indianapolis office of a New York public relations firm, "you'd be ill-advised to say so. The people here are so gung ho that they can't cope with that."

Big-league baseball is perhaps the only badge of big-time sports status that has thus far eluded Indy. When baseball expansion seemed possible a few years back, a group of Indy investors promptly formed a paper team, the Arrows, and collected deposits for more than 11,000 season tickets. But Indy's reputation for athletic aggressiveness also has its downside. When word got out that Art Angotti of the Arrows group was going to Pittsburgh to confer with the owner of the struggling Pirates, Angotti got a call from a Pittsburgh city official threatening to arrest him for "tampering with a mu-

nicipal facility" if he showed up in the city. He didn't; the owner went to Indianapolis.

While the sports explosion snared most of the headlines, the city's cultural institutions were quietly expanding and striving upward with their own form of Hoosier hustle. The two leading museums, the Indianapolis Museum of Art and the Children's Museum (the world's largest), both moved to more capacious quarters in the 1970s and both are expanding again. The celebrated Children's Museum has five floors of beguiling hands-on exhibits ranging from the most extensive toy train collection anywhere to an Indy racing car and a working carousel. A modern dance troupe arrived in 1972, a ballet theater and an opera company a year later, and two decaying downtown movie palaces were restored to house a repertory theater and the Indianapolis Symphony Orchestra. In 1984, *New York Times* critic Harold Schonberg ratified the orchestra's status by ranking it among America's top 15.

Indy takes none of this in stride. Success has bred more success, one risk has spawned another, but the hustling never quits. In its own down-home, heartland way the Indianapolis story is a classic expression of the characteristic American drive to get ahead, to triumph through hard work, to *make it*. Rave reviews for touring Indy performers are reprinted in the local papers. The recent acquisition of highly regarded British conductor Raymond Leppard as music director of the symphony was reported as a civic coup. "We all feel the pressure to grow, and we accept it," says Robert Yassin, director of the Museum of Art. "Sometimes you feel caught in a whirlwind here. It all happened so fast. But there's a feeling that tomorrow will be a brighter day, the city just keeps going." The museum conducted classes in Latin American culture and is presenting a special exhibit, "Art of the Fantastic: Latin America 1920-87," in conjunction with the Pan Am Games. With Hoosier practicality, the Pan Am organizers are using the orchestra's theater on Monument Circle as the venue for the weight-lifting event.

State Senator Julia Carson argues that urban problems remain. " 'Priorities' is the word," she says.

The most visible symbol of the Indianapolis renaissance is its gleaming downtown heart. More than a billion dollars in public and private funds has been poured into the new hotels, office buildings, theaters, restaurants and other kinds of development in the area once marked by dust-caked storefronts and empty sidewalks after dark. A visitor craving a croissant need not fret nowadays—a "food court" is never far away. A new hotel is rising next to the capitol building; the unfinished Pan Am Plaza a block away will contain two ice rinks and an office complex. The Indiana Roof, a ballroom with a Spanish Baroque motif that enjoyed its heyday in the 1930s, reemerged in the '50s and reopened last year with a $5.5 million face-lift and a computer-generated weather machine that drops snow made from shredded cellophane on the dancers.

The old Union Station terminal, restored and transformed into a hotel-restaurant-food court and retail-shops complex at a cost of $60 million, is a showpiece of Indy's new downtown. With its lovingly rehabilitated tile columns, varnished wood, steel girders and ghostlike plaster mannequins representing travelers in an earlier America, the station has become the most popular show in town, attracting more than 13 million visitors in the first year following its opening in the spring of 1986. Developer Bob Borns lopes around the clangorous station with long, sweeping strides, eyeing the ringing cash registers and chatting amiably with anyone who halts his flight. "That's the Hoosier litmus test," statewide newsletter publisher Harrison Ullmann observes. "They won't let you get too big for your britches." Borns, who has financed several downtown projects, sees Indy's dazzling new city center as a potential "urban Disney World."

"Every city has its moment"

He may be right. The $200 million White River State Park, including a 65-acre downtown zoo, a pleasuring-ground modeled on Copenhagen's Tivoli Gardens, and a controversial 750-foot-high tower which is still on the drawing board, is due to open in stages over the next few years. The Lilly Endowment, again, was the park's principal financial angel. "I think every city has its moment, its time when things can happen," says Sid Weedman, who runs the White River Park project. "Ours is now." A new commercial mall featur-

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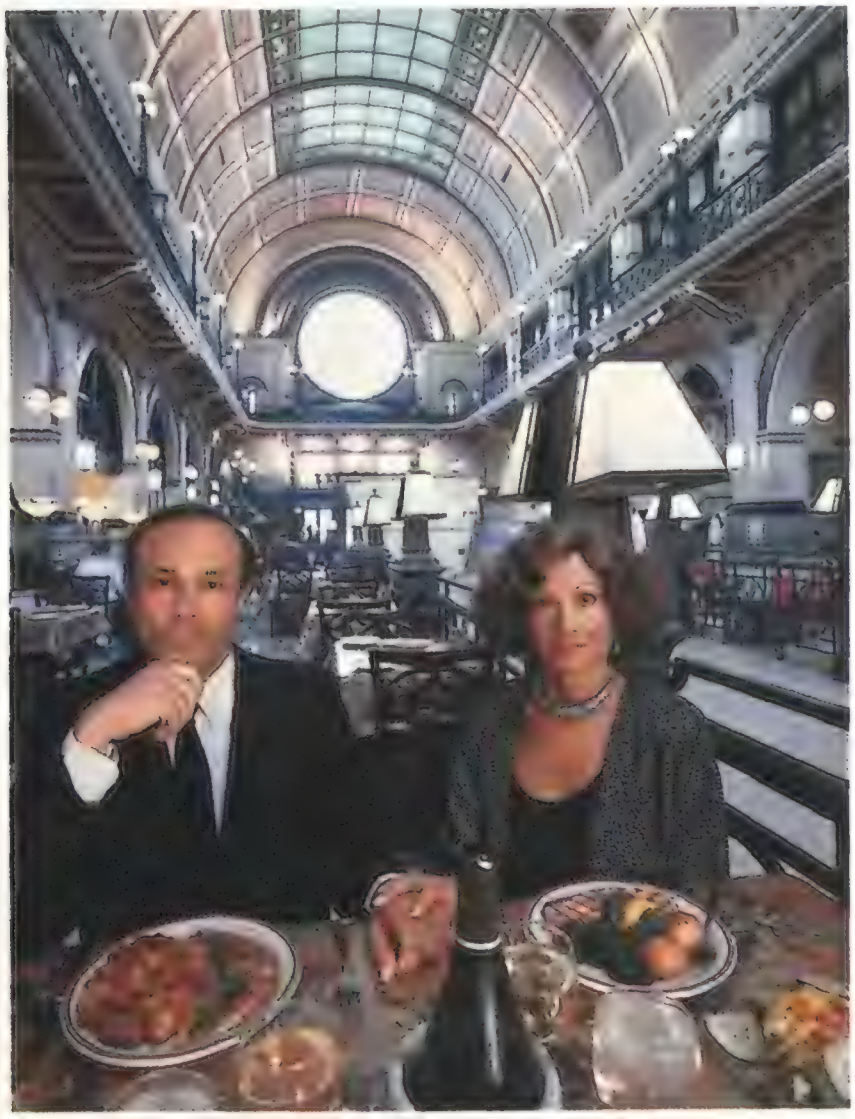
Though leaving for a new job in Paris, John Nelson (above), symphony director for ten years, lauds Indy.

Hollister Sturges, chief curator of art museum, stands at Robert Indiana's famous sculpture, *Love*.



Preservationists and investors Bob and Sandra Borns dine in refurbished grand hall of Union Station.

ing a covered walkway spanning the several blocks between Monument Circle and the Hoosier Dome is in the planning stage.

A few voices in the Hoosier wilderness complain that Indy's leaders have ignored or neglected some unpleasant social and economic realities in their drive to glitz and glory. "With the exception of Lilly, the city still doesn't control its own economy," says Harrison Ullmann, who publishes the muckraking *Indiana Letter*; "most of the big employers are from out of town." Ullmann also points out that the city's declining industrial base has not been offset by the new development.

Fay Williams, a prominent black attorney, contends that human problems have been slighted in the building boom and that "civic pride is a luxury" for people without job skills or adequate low-cost housing. "Development here is a game only a few can play," she says. "They draw the covered wagons around them." (Two old men encountered in an office building lobby, one resembling Frank Bartles and the other Ed James, dismissed the downtown revival as "nice, but all for the rich.") Williams faults the Lilly Endowment for "failing to lead a renaissance in human development." Mike Carroll of the Endowment replies that although housing and neighborhood revitalization have been neglected, the foundation has now moved

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Once there was this huge inland sea. Part of it covered what's now Kentucky.

Then Mother Earth shrugged her geological shoulders, and what was seabed, rich in calcium and phosphates, became dry land.

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You see, water that's trickled and seeped its way through limestone is the best water there is for making Bourbon.

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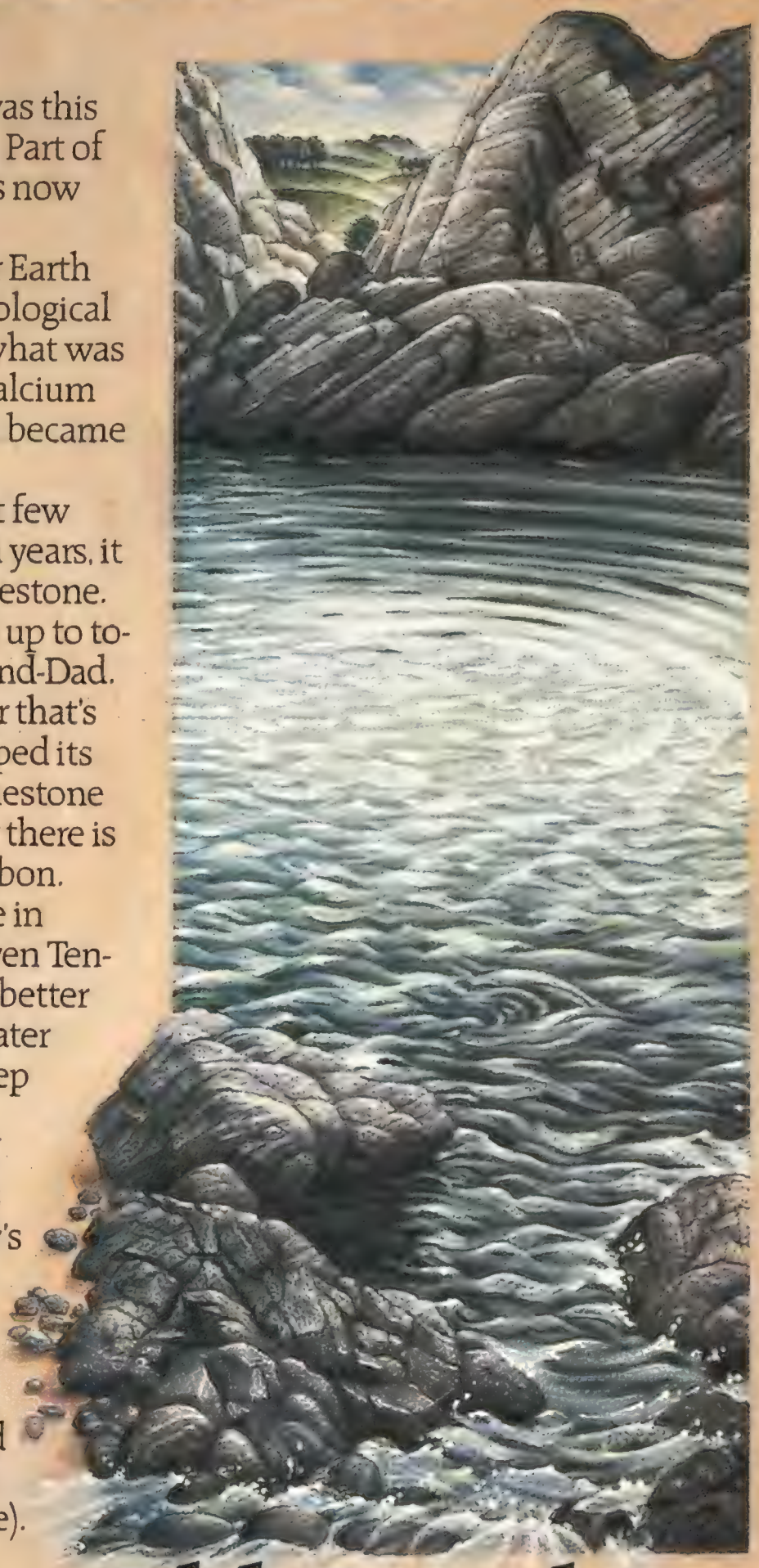

That's not to say you can't make a tolerable Bourbon if you're extra particular about the quality of the grains you use, like we are. You also have to make sure your new white-oak barrels are charred just so, like we do. And it certainly helps if your Bourbon-making skills have passed down through generations, like ours have.

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Old Grand-Dad

HEAD OF THE BOURBON FAMILY

Kentucky Straight Bourbon Whiskey. 86 Proof. Old Grand-Dad Distillery Co., Frankfort, KY 40601 ©1987 National Distillers.

Mark Miles and friend Amigo get ready. Miles is president of the Games, Amigo is official mascot.

them "to the front burner. I think we'll focus on that in the next five years," he says.

Mayor Hudnut, the Spanish student, orchestrates and oversees the Indianapolis revival from his top-floor office in the 25-story City-County Building. Lean and energetic, the 6-foot-5 ex-preacher is liable to pop up almost anywhere Indy's name is mentioned. He's in Asia, talking to businessmen who are considering moving a plant to the United States. He's in New York to quash a putative raid on the NBA Pacers. He's in Mexico City lobbying for the Pan Am Games. At home he plays chess with the Indy grammar schoolers who won a national championship (the Mayor lost), he dispatches moving vans to Baltimore to collect the Colts' belongings, and he writes a letter to *Time* objecting to a passage that said Indy is "in a positive fever to become someplace else." He brings his abundant charisma to his pursuit of the Indy grail; he has "so much charm," says Ullmann, "that if he fired you you'd feel gratified to be singled out for this distinction."

The Mayor acknowledges that "Nirvana hasn't arrived yet" and declares that he hopes to build low-cost housing and improve the city's economic base along with its image. Indy offers various inducements to businesses moving into town, including zoning concessions and tax abatements that enable a firm to defer some payments for as long as ten years. The scorecard on new businesses has thus far been mixed: Purolator Courier and Overland Express recently relocated there, but Western Electric and Stokely-Van Camp decamped.

A recent catch was the Hudson Institute. Thomas Bell jr., Hudson's president, says that escalating expenses mandated a move and that the Institute was courted by several Western and Midwestern cities including Phoenix and Columbus, Ohio. The Indy contingent was "organized, united, they knew what they were doing and they could move fast," he says. They also offered a satchel of sweeteners, including subsidized moving expenses and $2.5 million in grants from the Lilly Endowment and Indiana corporations.

Bell has no regrets. "Here we're in the middle of what most of the country is all about—agriculture, education, business-labor relations. Washington and New York are more parochial than Indianapolis. They ask us what's going on 'out there' because we now represent 'out there.' And Indianapolis appreciates us. I'm sold," he declares. "We're not going anyplace. I'm a Hoosier." He has the volunteer obligations to prove it —he's on the boards of the art museum, the Pan Am Games and the Indiana Sports Corporation.

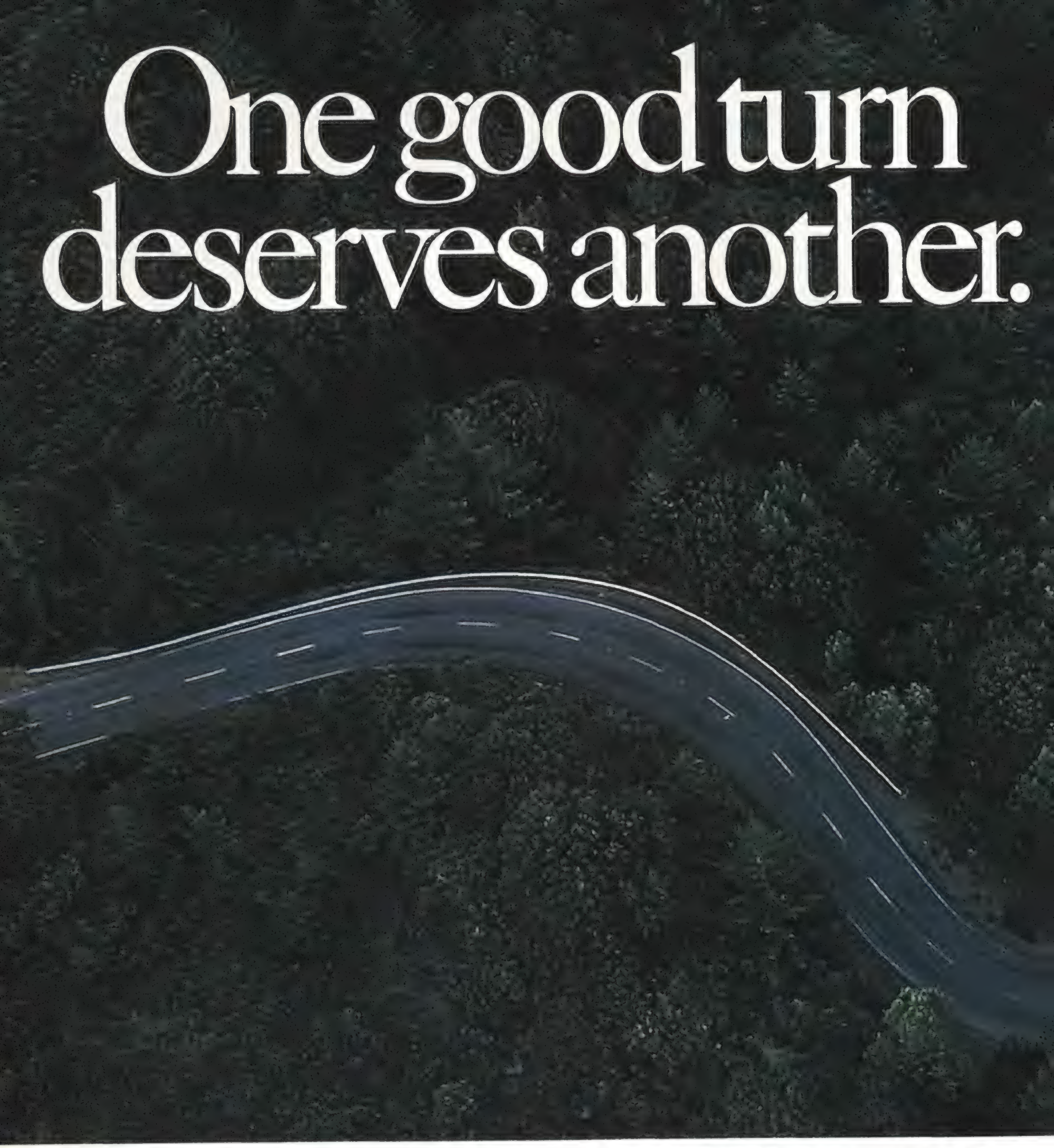
In the final analysis Indy's most marketable asset may well be the Hoosier personality: eager, likable, sensible, self-effacing. In 1850 a Missourian named William Rothwell sketched a collective portrait of the Hoosiers he met on his way to the California goldfields. They were "plain, open, free and sociable," he wrote, with "a certain simplicity of countenance and manner peculiar to Hoosiers." They still are. "We want visitors to like us," Sid Weedman says, "not just to come here for an event." Harrison Ullmann believes that Indy has not yet shed its self-doubts. "It's still pretty aw-shucks here," he says. "There's a hesitancy to brag to out-of-towners. It's as if we think that if something were really good it wouldn't be in Indianapolis." Counters Ted Boehm: "I'm ready to declare victory on the question of whether we're a big-league city."

Despite its well-orchestrated campaign for a national name, Indy still behaves like the one-on-one, home-and-family town it's always been. An intermission at a "family day" NBA game features a lay-up contest between two Hoosier families—Mom, Dad and two kids each. The home folks are free to use most of the elaborate world-class sports facilities. Cab drivers, policemen and others who deal with the public are regularly briefed on the details of such attractions as Union Station and the Pan Am Games. "I want Indianapolis to be a major-league city with a hometown atmosphere," Mayor Hudnut says, and so far it still is. Its new eminence and the attendant complications may eventually alter homespun Indy, but it hasn't happened yet; there are no signs of an identity crisis.

The closest thing to it may have been a slogan Indianapolis latched onto a few years ago: "Apple [as in the Big Apple] is our middle name." But the T-shirts bearing this misleading message are nowhere to be seen nowadays. Indy's grown out of them.

Energized Lisa Buckner, 5, having electrifying time at the Children's Museum, sums up Indy's spirit.

One good turn deserves another.



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HONDA The Prelude

By John P. Wiley jr.

Dinosaurs shake the ground in paint and sculpture

Two exhibits trace how scientists and artists have refined our image of the reptiles that were lords of the Earth for 140 million years

In a long-ago world that only an artist can show us, a feathered *Archaeopteryx* chases down a dragonfly.

Of all the animals that have roamed the changing landscape of this planet in the past half-billion years, none has captured the imagination of the currently dominant bipeds like the "dragons" we call dinosaurs. Generations of children have lit up with excitement as they walked into a museum gallery in which the skeletons of these legendary beasts towered over their heads. Not a few sustained that moment of wonder throughout their lives, growing up to be paleontologists who study the fossil remains of dinosaurs, and artists who work at giving them life once again.

Our understanding has come a long way since the late 1600s, when a dinosaur thigh bone was identified as that of a giant human who had lived before the Biblical Flood. The realization that giant reptiles had once walked the Earth, and our first visualizations of them, came only in the 1820s. (Dinosaur tracks discovered in 1802 in Massachusetts had also been connected to the Flood, specifically to a giant raven sent out from Noah's Ark to reconnoiter.) Between 1822 and 1825 English paleontologists began publishing papers on the extraordinary fossils they were finding in Tilgate and Stonesfield. Not until 1841 did Richard Owen, the preeminent anatomist and paleontologist of his day, coin the name dinosaur from the Greek *deinos*, meaning "terrible," and *sauros*, for "lizard."

Since then our knowledge of dinosaurs has moved forward in explosive jumps (one of the most important coming with the discovery of the dinosaur fossil treasures of the American West a century ago) and periods of quieter synthesis (often when funds were low, as during the Great Depression). New ideas and some remarkable discoveries in Montana make the present time one of the most exciting since a British surgeon named Gideon Algernon Mantell dug *Iguanodon* teeth out of a Sussex quarry in the early 1820s.

Today we see more clearly that the dinosaurs, unlike many present-day reptiles, were active, agile and—at least in some cases—fast on their feet. In Montana we now have hard evidence of communal nesting and strongly suggestive signs of parental care of young. Tracks preserved through the millennia appear to show that some dinosaurs moved in groups. The time has come for a new look at dinosaurs, a shift in the public perception of what these animals were really like.

Beyond them, the heavy legs of a sauropod blend with tree trunks. By positioning the bird so close to the ground, John Gurche has avoided the question of how well it could fly. Maybe it has simply lunged.

Two exhibitions which are opening this month at Smithsonian's Museum of Natural History track our progress in understanding the dinosaurs. Both were organized last year at the Natural History Museum of Los Angeles County. One is devoted to the work of the artist Charles R. Knight, who began at the turn of the century a 50-year career of turning the best information available to scientists into visual images: drawings, paintings and sculptures. The protégé of Henry Fairfield Osborn, then president of the American Museum of Natural History, Knight painted many of the museum dioramas and magazine, book and newspaper illustrations that formed our vision of dinosaurs for more than half a century.

The 141 drawings, paintings and models of the second show, "Dinosaurs Past and Present," document how the associated art has progressed along with scientific knowledge. The earliest piece, from the mid-1800s, is by Benjamin Waterhouse Hawkins. Working with Richard Owen, he produced the first life-size restorations of dinosaurs for an exhibit at the Crystal Palace. The show includes works by Knight and a preparatory study for the 110-foot Yale mural depicting 300 million years of reptile evolution for which Rudolph Zallinger won the Pulitzer Prize in 1949 (pp. 88-89).

Much of the second show is devoted to current artistic representations of our understanding of the dinosaurs. Sylvia Czerkas, an artist and coauthor of a biography of Knight, is the curator of both shows. Writing about "Dinosaurs Past and Present," she has said:

Charles Knight based this painting of two fighting *Dryptosaurus* on fossils from a mine in New Jersey. The 1897 work has been called startlingly modern: it shows them far more agile than most people thought.

"The refined images of this new generation of contemporary illustrators has the benefit of a general consensus in the scientific community about our modern-looking dinosaurs. They can concentrate on synthesizing anatomy, behavior and the paleoenvironment into sophisticated and spectacular views of the prehistoric world."

A highlight of the show is a 20-foot, life-size model of *Allosaurus*, a predator, by sculptor Stephen Czerkas, Sylvia's husband. His work translates the latest thinking about dinosaurs into tangible reality. One work added to the show for its Washington appearance provides the antithesis of the modern view: a 1910 drawing that depicts a "sprawling" *Diplodocus* with its legs out to the sides like a modern-day lizard. (Paleontologists know from its bone structure that it actually stood upright, like a mammal.) The drawing, now restored, was found in the collections of the National Museum of Natural History.

Nicholas Hotton III, curator of fossil amphibians and reptiles at the Museum of Natural History and an unabashed dinosaur fan, has some thoughts on our ongoing fascination with these long-dead creatures:

"What this show gives us is the drama of the dinosaurs, especially their size. What impresses people more than anything else is their *size*. But the show also lets us see that just because they were big and reptilian does not mean that they were slow and stupid. The more lively picture is indeed the modern one, but it is also true that some of the work done a long time ago shows dinosaurs just as lively as anything being produced today. The end result is that despite 150 years of work on these animals, we still have a lot to learn from them. And I would add that there is still a lot to be learned from the work of our predecessors."

Both shows will be in Washington through August. "Dinosaurs Past and Present" will be in New York at the American Museum of Natural History from October 9 through January 3, 1988, and then travel to New Mexico, Alberta and Ontario. The Knight exhibition will be in Memphis at the Memphis Pink Palace Museum for three months starting in October and will go on to Alberta and New York next year.

Dinosaurs ruled the world for many millions of years and continue to rule the imaginations of many of us today. For the 8-year-old who collects pictures and memorizes the mouth-filling names, for the adult patiently digging in the arid badlands of the West, the Age of Reptiles continues. These two shows—and Smithsonian's permanent exhibit—help explain why.

Two *Tyrannosaurus*, the ultimate symbol of ferocity, search for prey in this 1985 Mark Hallett rendering. Pterodactyls above wait for a feeding opportunity; the bones of an earlier victim litter the ground.

Another Gurche work has three *Deinonychus* working together to bring down a larger, feeble *Iguanodon*.

"Good-mother" dinosaurs may have traveled in herds, as in Douglas Henderson's Montana aerial view.

Benjamin Waterhouse Hawkins was the first artist to work with paleontologists. His 1870 conception of long-ago England has dim-witted creatures of the swamp sluggishly dragging their tails on the ground.

Mark Hallett's *Mamenchisaurus* is first rendering of this animal from Sichuan province in China. The neck alone measured 33 feet, longer than that of any other known vertebrate in the history of life.

A mural at Yale University's Peabody Museum depicts 300 million years in the ongoing evolution of reptiles. The project took four years; on exhibit is this six-foot preparatory study that itself took a year to complete.

Time runs from right to left. Mammal-like reptiles with sails were early; *Tyrannosaurus* and horned *Triceratops* at far left came later. Vegetation changed, too; note the flowering magnolia next to *Triceratops*.

Well-horned *Styracosaurus* whirls to fight off a *Daspletosaurus* in another work by John Gurche.

This painting epitomizes the modern view that "terrible lizards" were as active as today's mammals.

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Newsweek

Why it happened. What it means.

By Peter Miller

The ups and downs of clambering on the roof of Europe

Since alpinism began there 200 years ago, Mont Blanc has witnessed more agony, ecstasy and sheer silliness than any other peak in the world

Storied massif looms over fashionable shops along Rue Vallot in Chamonix, capital of mountain climbing.

On a sunny August day a little more than 200 years ago, Baron von Gersdorf, a visitor to an obscure mountain village in the Savoie about 40 miles southeast of Geneva, trained his telescope on two tiny figures climbing in deep snow and halting every hundred steps or so to catch their breath. They were struggling just below the summit of the legendary Mont Blanc, a gleaming pile of rock and ice that loomed over the surrounding landscape of peaks and glaciers like a white whale breaching the sea. When the climbers finally reached the top, von Gersdorf saw one of them tie a handkerchief to his staff and wave it. To make sure the ascent was confirmed, the Baron called others to witness it—and with good reason. Michel-Gabriel Paccard, a local doctor, and Jacques Balmat, his porter, had just become the first men to conquer western Europe's highest mountain.

The date was August 8, 1786, the town was Chamonix and the ascent marked the beginning of the sport known as alpinism, or mountain climbing. Last summer, Chamonix, now a sprawling year-round tourist center, was the scene of numerous special events commemorating that momentous feat—light shows, fireworks, reenactments of one kind or another. But the most impressive tribute to the legacy of Paccard and Balmat is the fact that more than 5,000 men, women and children will have climbed Mont Blanc in this bicentennial year.

The heavy traffic on its slopes nowadays does not mean that Mont Blanc has grown smaller or less challenging with the passage of time. It is, rather, a reflection of its reputation as a spiritual home to people all over the world who love high places. Situated near the borders of France, Italy and Switzerland—the 15,771-foot summit belongs to France—it has no particular physical distinction other than its brilliant glacial whiteness. At least 50 other mountains are taller. But Mont Blanc retains a special presence that has as much to do with history as with grandeur. Climbing tools and techniques were developed on and around it. Many of the world's most famous climbers have trained there. It was the scene of the first scientific high-altitude experiments and the first mountain expeditions. The first women climbers practiced their skills on Mont Blanc. The first association of professional mountain guides was founded in Chamonix, which became the first mountain resort for tourists.

In 1850s lithograph, top-hatted climbers encounter difficulties tackling formidable tower on Mont Blanc.

The mountain where climbing began

Mountain rescue methods were pioneered around Mont Blanc, too; it has claimed the lives of more climbers than any other peak in the world.

If it has been a witness to both triumph and tragedy, Mont Blanc has had to bear up under a good deal of silliness and shenanigans, as well. Nineteenth-century socialites organized a number of elaborate expeditions to the top, and at least one decidedly nonadventurous sport had himself hauled around the glaciers on a sedan chair and a sled as a lark. In 1851, an English promoter named Albert Smith climbed the mountain with a party that consumed 96 bottles of wine, champagne and cognac. A *Life* magazine photographer, Charles Bonnay, parachuted onto the peak in 1961 with two colleagues from *Paris-Match*; they took pictures on the way down with cameras mounted on their crash helmets. A small plane landed on the summit in 1960, and since then descents have been made by bicycle, motorcycle and hang glider. Last summer a Spaniard set a record for staying on the summit for the longest period of time; he lasted 40 days before he got bored and went home.

All of this frivolity is a far cry indeed from the dread that Mont Blanc and other mountains inspired before Paccard and Balmat stripped away centuries of superstition. In many parts of the world, the heights were regarded as the haunting grounds of Satan and his confreres—all sorts of demons and dragons. People who went up into the mountains were often accused of consorting with the devil, and they were "purified" by burning at the stake. In 1708, a fellow of the Royal Society of London did a study on the natural history of the mountains and categorized all of the alpine dragons; some, he claimed, were even friendly.

There were, however, a few cracks in this veneer. In the 13th century, Peter III of Aragon climbed Canigou, a 9,137-foot mountain in the Pyrenees, and claimed he awoke a dragon when he threw a stone into the lake at the summit. Leonardo da Vinci attempted to scale a peak—possibly the 15,203-foot Monte Rosa—on the Italian-Swiss border and climbed to 10,000 feet before turning back.

It was an amalgamation of exploration, science and revolution that eventually led to an all-out assault on Europe's mountains in the latter part of the 18th century. Horace-Bénédict de Saussure, a Genevan scientist who is known as the father of modern alpinism, made the third ascent of Mont Blanc in 1787. (The second was made by Jacques Balmat and two local guides.) De Saussure's ascent was not a simple climb but a scientific expedition. It consisted of 18 guides (including the ubiquitous Balmat) and de Saussure's valet. De Saussure took along instruments to measure the humidity of the air and the temperature of boiling water at high altitudes, important experiments in those days. He also noted the color of the sky and made physiological studies of the other climbers.

De Saussure's expedition became the talk of Europe's courts and salons, and partly because of that,

Vermont writer and photographer Peter Miller is a serious skier and a frequent visitor to Chamonix.

Paccard and Balmat were first to scale Mont Blanc; de Saussure made third ascent with Balmat as his guide.

Imaginative 1853 print depicts large party of climbers negotiating glacial area cut by dangerous crevasses.

Chamonix soon became a fashionable resort. Goethe visited the town, as did former Empress Josephine in 1810. Her retinue required the hiring of 68 guides and porters to take her to the bottom of the Mer de Glace glacier at Montenvers, a few miles from town. Two years earlier a Chamoniard, Marie Paradis, had become the first woman to stand on the summit. Some guides had told her that the first female mountaineer would be treated as a celebrity by foreign visitors. What she herself said after her ascent was more down to earth: "At the Grand Plateau, I couldn't go farther. I was feeling very sick and I lay down on the snow. I was panting like a hot chicken. They took me by both arms and dragged me. . . . I told them to throw me in a crevasse and go where they pleased. . . . Finally, we arrived. . . . I climbed up, I almost died; I was dragged, carried. I panted a lot, I saw black and white and I climbed back down."

In 1838, a 44-year-old woman of French nobility named Henriette d'Angeville climbed the mountain with six guides, six porters and a pigeon. Her clothing was carefully selected and made the illustrated newspapers. She released the pigeon on the summit to verify her climb but it never returned to Chamonix. She went on to complete 22 ascents in her lifetime. Her most memorable quote, made to her guides on the way up, reveals a spirit quite different from that of Marie Paradis: "If I die before I reach the summit, promise me that you will carry my body up and bury it there."

Shelley and Byron both wrote sublime verse about the majesty of Mont Blanc. Novelist Alexandre Dumas père came and rambled around with so much vigor that he exhausted his guides. More and more English arrived, and the first hotel was appropriately named Hôtel d'Angleterre.

Between 1786 and 1876, 514 ascents of Mont Blanc were accomplished by 795 persons. During the centennial of the Paccard-Balmat ascent, thousands of people attempted the climb. Some of those climbers were seeking danger; more, probably, were pursuing pleasure and prestige. Scaling mountains had become the thing to do, and the guides of Chamonix had developed special equipment to make it safer and easier: the ice ax, crampons, smoked glasses. The guides had also learned how to glissade—slide down the mountain in a crouched position, controlling speed by dragging the ax in the snow—and to rappel, which is a method of descent by sliding down a rope.

Inevitably, as mountain fever swept Europe and climbing activity on Mont Blanc increased, so too did

French astronomer Jules Janssen had himself hauled up the mountain during construction of observatory on the summit. Used for a while as a weather station, Janssen's building collapsed into a crevasse in 1907.

Nineteenth-century alpinists celebrate on rounded summit in rendering based on English climber's sketch.

Fashion illustration shows dress, stockings considered chic for climbing in 1870. Practicality came later.

the number of accidents occurring there. One of the most poignant episodes involved the first Americans to die on the mountain, John Randall and Joseph Bean. In the fall of 1870 they ascended with two English climbers and seven guides and porters. All perished in a fierce storm that blew for several days. The bodies of Randall, three guides and two porters were never found. Joseph Bean was discovered with some notes addressed to his wife:

"Tuesday, September 6. I've made the ascent of Mont Blanc with ten persons . . . arrived at the summit at half-past 2 o'clock. Immediately after leaving it I was enveloped in clouds of snow. . . . I was ill all night.

"September 7 (morning). Intense cold; much snow, which falls uninterruptedly; guides restless.

"Sept. 7 (evening). My dear Hessie, we have been two days on Mont Blanc, in the middle of a terrible snowstorm; we have lost our way. . . ."

Then, in a barely legible scrawl:

"Perhaps this book will be found and forwarded. We have nothing to eat; my feet are already frozen, and I am exhausted; I have only strength to write a few words. Tell C. I have left the means for his education; I know you will use them well. I die trusting in God and in my love for you. Goodbye to all. I trust we may meet in Heaven. To you forever. Yours."

It was the English, however, with their intrepid French guides, who blazed new trails in mountaineering. A London publisher sent artist Edward Whymper to the Alps to do some sketches in 1860. He found his avocation, which was climbing, and was lucky to pair up with the Chamonix guide Michel Croz. Between 1864 and 1865 they climbed many of the difficult peaks that cut across the sky near Mont Blanc like the prows of racing sloops. Their spectacular ascents opened up the eyes of many other mountaineers to what they, too, could achieve if they set their hearts to it.

When a triumph turned to tragedy

Photographs of Whymper at an older age show a carefully dressed man with thin hair and a strong face underscored by haunted eyes. His greatest victory, in 1865, was also his greatest tragedy. He, Croz and a party of five others conquered the Matterhorn. On the descent there was a mishap involving Douglas Hadow, an inexperienced climber, and Croz. Hadow, it is believed, slipped and knocked over Croz; four climbers then fell 4,000 feet to their deaths. Whymper never recovered from that episode. He became a wandering mountaineer, climbing in Greenland, and in South and North America. He returned to Chamonix in 1911 and wrote in the register of the Hôtel Couttet: "Edward Whymper: English; profession: none; date of birth: April 27, 1840; observations: very content." Seven days later he died. He is buried, along with other mountaineers, in the Chamonix cemetery at the foot of Mont Blanc.

Much of the gusto with which Victorian England took up mountaineering was due to the showmanship of the aforementioned Albert Smith. He and three other Englishmen met in Chamonix and together set up an expedition, hiring 16 guides and about 20 porters. Their bivouac became a wild party, with dozens of empty bottles thrown about. Early the next morning, the guides were adamant about leading their charges to the summit. There, Smith fell to the ground and slept. When he awoke, the group finished off the champagne and staggered down the mountain.

Promoting Mont Blanc in Britain

Back in London, Smith decided to give a lecture on his ascent and hired Egyptian Hall at Piccadilly. He found himself playing to a full house and ended up huckstering Mont Blanc for six years. He showed pictures, made up stories, imitated guides and added music to his patter. He made playing cards with scenes from Mont Blanc and designed a game. He brought over a guide and some Saint Bernard dogs from Chamonix. He tried to bring over some chamois, too, but they died en route. Smith led a group tour to Chamonix (only two of the 50 tourists made the summit) and he also escorted the Prince of Wales. The Prince, who was to become Edward VII, did not make the ascent.

The years from the 1860s to the turn of the century came to be known as the golden age of climbing. The major peaks of Europe were conquered during that time, and the highest mountains of South America, the Caucasus and Africa, as well. Sophisticated climbing techniques were developed by a studious-looking Englishman, Albert Frederick Mummery, with his Swiss guide, A. Burgener, and his climbing partner, B. Venetz. Often barefoot or in stocking feet, the daring trio scaled many of the aiguilles that surround Mont Blanc—sharp needles of granite that look too frightening to even think of climbing. The 19th century ended on an appropriately lofty note with the construction, by French topographer Joseph Vallot, of a shelter and observatory 1,500 feet below the summit of Mont Blanc. From that vantage point Vallot studied the heavens, the glaciers and the altitudes of the mountains, and made new maps of the region.

Jules Janssen, a French astronomer, saw Vallot's observatory and resolved to build a better one right on the summit. After persuading Gustave Eiffel to participate in the design of the structure and obtaining backers for the project in Paris, Janssen returned to Chamonix. Partially crippled and quite heavy, he had guides bear him to the summit in a chair mounted on

Daredevil combining parasail and skis looks for a smooth slope to land on after soaring off the heights.

Patrick Vallencant, who recently scaled Mont Blanc four days in a row on skis, pitches down a steep incline.

long poles. Janssen's observatory functioned for a time as a weather station but there was, it turned out, a serious problem. The structure rested atop a shifting glacier and in 1907, the year of Janssen's death, it sank into a crevasse.

In this century, climbers have turned their attention to the world's highest mountains—to McKinley (Denali) in Alaska, which was first ascended in 1913; to Mt. Logan in the Yukon, which was topped in 1925; to the mighty peaks of the Himalayas, including Annapurna and Everest, which was scaled by Sir Edmund Hillary and Tenzing Norgay in 1953. Alpinism is much more complicated than it used to be. Climbing is categorized into various types and degrees of difficulty—everything from bouldering and rock climbing to something called the "big wall" (long rock climbs such as those done at Yosemite) and "super" alpine climbing (solo ascents timed by a stopwatch).

Crowded summits and littered slopes

Alpinism has changed in other ways too. Where once it was an elitist sport, today adherents come from all walks of life and in ever-increasing numbers. The slopes and summits of many of the world's best-known mountains are often crowded with climbers and littered with the evidence of their passage—tinfoil, cans and bottles, discarded equipment and clothing. It is getting harder and harder to experience the ultimate payoff of climbing—a peaceful moment of lonely exhilaration atop a silent peak.

Everything that has been happening on other mountains in recent years probably happened at Mont Blanc first. Climbers there have continued to seek out ever more difficult routes and to experiment with a seemingly infinite repertoire of techniques. Winter alpinism has come into vogue. The current fad involves climbing solo without ropes. And daredevils always seem to be coming up with outrageous new stunts. Not long ago a ski mountaineer named Patrick Vallencant went up Mont Blanc on skis four days in a row—accompanied, on one trip, by his 11-year-old son. In 1985, the first ascent was made by a sled-dog team of five huskies. Last summer two Frenchmen ran from Chamonix to the summit and back in the record time of 7 hours 56 minutes, and two young men on ski boards "surfed" down the precipitous route climbed by Paccard and Balmat.

Mont Blanc, too, is often distressingly crowded. During the summer climbing season, more than a hundred people a day may mill about on the summit. The slopes and trails are crisscrossed by no fewer than 57 lifts; even so, there is sometimes a two-hour wait. Chamonix has a year-round population of 10,000 but there are beds for 25,000 guests; more than a million

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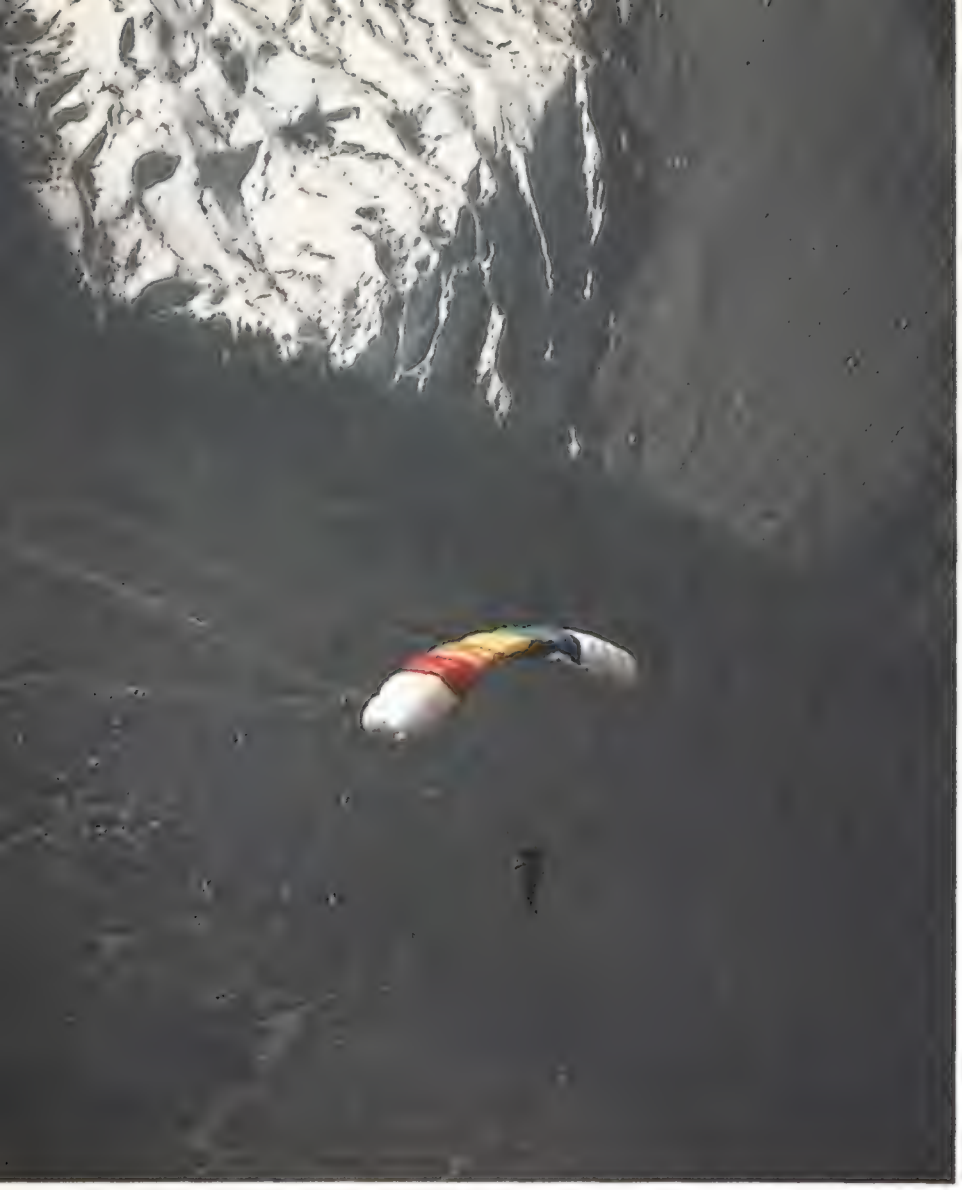

A parasailor glides over switchbacks on hiking trail; sport has become increasingly popular at Mont Blanc.

Nouveau alpinist in a *ballule*—sphere inside larger inflated sphere—bounces down slope near Chamonix.

skiers, climbers and other tourists pass through town each year. The streets are jammed with shops and shoppers; the valley is full of resorts.

One thing about Mont Blanc that has not changed is the awesome prospect it affords those who strive for the summit. Many climbers take a cog train about halfway up, spend the night at a shelter and then start out in the dark the next morning, while the footing is still firm. At dawn, the snowfields, crevasses and huge blocks of ice called seracs turn glorious shades of blue and pink in the glow of the rising sun. Far below, the valley stretches out under a blanket of mist. During the last 1,500 feet or so of the ascent, most climbers are too busy negotiating the narrow path or too preoccupied with altitude sickness to appreciate the view. But once the gently domed summit is attained, there is time enough to savor the dramatic scenery before beginning the long descent.

For all its overdevelopment and rampant tourism, Chamonix remains the capital of mountain climbing. The Musée Alpin, which houses one of the sport's leading collections of artifacts, is located there. The Compagnie des Guides de Chamonix-Mont-Blanc, the local guide association, has 140 members who make about 4,000 ascents a year with their clients. The Ecole Nationale de Ski et d'Alpinisme, a school run by the French government, trains young men and women from all over the world to be ski instructors and mountain-climbing guides. The Peloton de Gendarmerie de Haute Montagne, a division of the national police, is the main mountain-rescue unit in Chamonix. These specialists have developed new emergency techniques that enable them to "de-ice" people wedged in crevasses by melting the ice around them, and to prevent hypothermia with a respirator that produces heated compressed air. The gendarmes often respond to distress calls in 20 minutes or less, employing Alouette II helicopters to lower men and avalanche dogs to the scenes of accidents.

Driving a car down the mountain

Silliness has remained a staple atop the mountain that is known as the "roof of Europe." Five years ago, an Italian stunt driver named Yvon Olianti had a helicopter lift a car to the summit. His intention was to drive the radically modified vehicle back down, but when the car started to pick up speed, Olianti jumped out. The next day he was arrested and later released from jail only on the condition that he have the automobile removed.

The zaniness continued last year when a champion pilot named Pascal Morel became the first man to land a microlight plane on the summit and take off again. Nearly two-dozen parasail enthusiasts convened on

Romance, sharing, devotion, memories, love.

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As part of bicentennial salute, artist Michel Guéranger sprays paint on the snow at an altitude of 14,453 feet.

In helicopter view, artist's crew inspects completed "fresco." Biodegradable paints decomposed in days.

the mountain for a contest to see who could jump off and land closest to a designated spot in the valley. And French performance artist Michel Guéranger used more than 250 gallons of paint to decorate almost 5,000 square feet of giant seracs near Mont Blanc's summit. "He sprayed bright colors—reds, yellows, blues—and it was an amazing thing to see," says Dominique Vulliamy-Lanctot, an editorial assistant at *Vertical*, a magazine produced in Chamonix for new-wave climbers and skiers.

Mont Blanc has not suffered such indignities lightly. Over the years, approximately 2,000 people have died or disappeared on its slopes; the glaciers of the Mont Blanc Massif conceal hundreds of bodies. In a typical summer, 40 or 50 climbers may perish in falls, storms or avalanches; last summer the death toll was 49. Those who die are usually young, inexperienced, ill-equipped and climbing without a guide. The carnage is disturbing to many, but the French believe that everyone has a personal right to climb and to encounter danger on his or her own terms.

The bicentennial celebrations at Chamonix were marred by the unusually large number of fatalities. A Frenchman and four West Germans plunged to their deaths in three separate accidents on the very weekend that had been set aside to mark the ascent by Paccard and Balmat. But the deaths did not interrupt the festivities, the highlight of which occurred when two French mountaineers, suitably dressed for the occasion in 18th-century costumes, reenacted the historic climb while television crews filmed their progress. In September, no less a personage than Pope John Paul II—an avid skier in his youth—visited the region, took a solitary stroll across a glacier and saluted Paccard and Balmat for their perseverance.

For France the commemoration provided an opportunity to redress an old wrong. Although Paccard claimed to be the first man to set foot on the summit of Mont Blanc, Balmat contended not only that he had preceded his listless partner to the top but also that he then went partway back down the mountain and dragged Paccard up. Dumas père wrote a widely read version of this account after having dinner with the loquacious guide, who imbibed more than a few glasses of wine before the evening was over. Paccard's reputation lay in ruins until modern historians uncovered evidence showing that Balmat was wrong. Accordingly, a suitably heroic bronze statue of Paccard was finally dedicated in Chamonix last summer, giving the gritty doctor his due two centuries after he earned it.

Climbers negotiating snowy ridge are enveloped in grandeur on their way to the highest peak in the Alps.

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Have you driven a Ford... lately?

Hochfein
Vollmilch

By Erik Larson

A close watch on U.S. borders to keep the world's bugs out

Federal inspectors daily match wits with a multitude of travelers from abroad, seizing hidden articles that harbor potential pests

Larvae of bean fly were detected on soybeans that a traveler from Philippines was taking to California.

That mango is loaded and Jesús Ramírez knows it.

Ramírez stands at one end of a table that could do double-duty for the local coroner. About the size of a pool table, it is stainless steel with sides that slope to an open drain. Travelers never see this room at the American Airlines terminal at John F. Kennedy International Airport. After a visit here, no supermarket produce section can look quite the same again.

The mango, confiscated from a woman from the Dominican Republic, is plump, satisfying in heft and just now turning a forsythia shade of yellow; it is one fine-looking piece of fruit. But Ramírez points his knife at two punctures, each invisible unless you know what to look for. "These are exit holes," he says.

He shaves around the holes, exposing a bruise that has spread through the mango's orange flesh like a plume of brown ink in water. He cuts deeper. The bruise darkens. "Look," he says.

Suddenly this mango does not seem so delicious. Something white wriggles up and breaches the pulp. A worm. Ramírez clears away some juice. This worm is not alone. "They're big suckers. Caribbean fruit fly larvae. Full-grown and ready to drop."

On the verge of creeping from the mango, these half-dozen larvae would have parachuted to the ground and, with a little luck, become full-fledged flies. Who knows? Depending on where that Dominican woman was headed, Ramírez could have averted the next attack of the Caribbean fruit fly, already found in Florida, there and elsewhere a most unwanted foreign pest.

I look now across the table and see all the other fruit there in a different light. This is the contraband table piled high with fruit nicked from travelers as they entered the country. After just five hours, it holds four dozen tropical golden plums, a hundred thousand Middle Eastern melon seeds, a thousand fresh peppercorns, 15 mangoes, a dozen guavas, two coconuts, one ham-and-cheese sandwich, Jamaican kola nuts, figs, olives, oranges, pomegranates, berries, quinces, orchids, yams and one bag of soil from Sparta. There are so many colors, it is as though someone split open a huge bag of M&M's and spread them all over the table.

There are living things buried in this rubble. Scale

Cornucopia of contraband foods seized from travelers arriving at JFK airport is part of one day's haul.

Photographs by Charles Krebs

Bug watch at U.S. borders

At JFK, inspector checks air cargo of foods imported from the Dominican Republic for any sign of pests.

insects cover a green coconut. Larvae wag from the ends of some of the peppercorns. Moths walk the kola nuts. And 600 snails, from two ruptured bags, begin panicking in slow motion.

Ramírez hunts illegal aliens, the kind that slip into the country buried in apple cores and guava pulp. He and a thousand other inspectors work for APHIS, the Animal and Plant Health Inspection Service, whose job is to protect American agriculture and its good name in foreign markets, where farmers and ranchers sell about $40 billion worth of agricultural products each year. The agency tries to keep destructive pests out of the country, tracks them when they're near, and maintains a survey and detection network to sound the alarm whenever a pest does get by. When worse comes to worst—when a dangerous pest starts an infestation—APHIS can mobilize squads of pest experts to contain and eradicate the interlopers.

Its first line of defense is the inspectors, like Jesús Ramírez, who check for contraband food in ships, planes and baggage, as well as in rail and truck freight. They know that many of the worst pests are adept hitchhikers. The Mediterranean fruit fly (Medfly) in its larval stage can hide undetected deep within an orange that otherwise looks healthy. Foot-and-mouth disease, a virus and one of the most feared livestock diseases, can survive in meats and even canned milk.

Stopping pests before they're a problem

APHIS operates around one central premise: it is far cheaper to keep pests out than to deal with them once they're in. By intercepting contraband foods, inspectors complement nature's built-in defenses. Winter, for example, would make short work of any Medfly that jumped ship in, say, Buffalo, New York. Other pests get consumed by Man or destroyed by garbage disposals and sewage-treatment plants. Those that do manage to set up housekeeping here may arrive in too few numbers to reproduce.

On the other hand, an alien pest that can reproduce here may find conditions even more hospitable than in its homeland. "When a new pest comes in from a foreign area, very often it leaves behind its natural enemies," says Michael Shannon, chief staff officer of APHIS' program planning group. "There's nothing to keep it in check." For the same reason, bugs thought harmless elsewhere can suddenly become pests here.

Invading pests can ruin farms, force job layoffs, boost grocery prices and cause foreign governments to shun U.S. products. In 1980, when the Medfly appeared in traps in Santa Clara Valley, California, growers there began living a nightmare that was to last for about two years. The best theory holds that the flies entered as larvae in a piece of fruit. Even though the Medfly did

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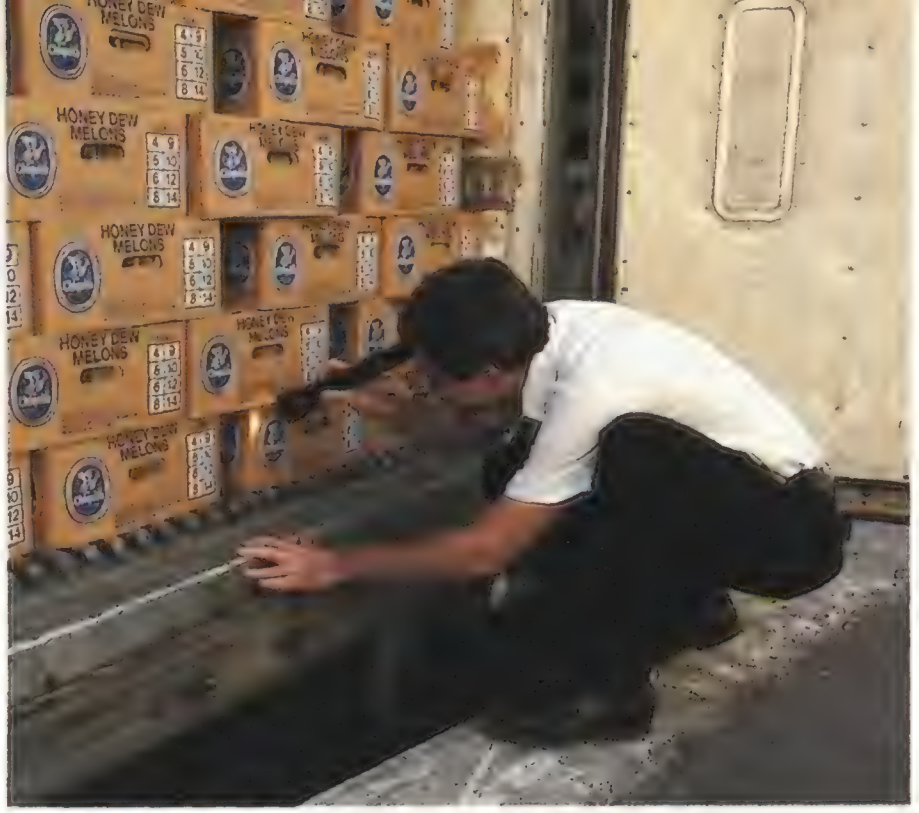

Miami inspector eyes bottom of shipping container for pests fallen from crates of Panamanian fruit.

Another Miami agent shakes out refrigerated flowers; the cold makes bugs sluggish and easier to spot.

not infest any commercial citrus groves, its presence nearby caused widespread havoc. Helicopters made nightly passes, spraying malathion over 1,300 square miles weekly; residents worried about their health, to say nothing of the finish on their cars. Growers attacked then Governor Edmund G. Brown jr., a Democrat, for not having planned to spray more quickly, and one Republican suggested the Governor be impeached. The state's growers lost at least $40 million when other nations rejected California fruit; state and federal authorities spent more than $100 million to eradicate the fly. Yet the damage could have been far, far worse. If the Medfly had been able to spread to its full ecological range, it would have infested 80 percent of the U.S. citrus crop at a loss of more than half a billion dollars in sales.

So when pests do get in, APHIS meets them with what it hopes will be overwhelming force, sometimes reaching beyond U.S. borders to try to head pests off before they get here. In 1978, African swine fever broke out in the Dominican Republic. As part of a joint U.S.-Dominican program, crews killed every domestic and wild hog on the island, then restocked the country with healthy swine. An APHIS report says there is "strong evidence" the virus entered the country in pork scraps from an international airliner, with the scraps then being fed to pigs.

The current inspection and quarantine program traces its roots to the Federal Plant Quarantine Act of 1912, passed after a rash of insect plagues. By then the United States had become a refuge for immigrating bugs, including some real baddies, such as the San Jose scale, cotton boll weevil and gypsy moth (SMITHSONIAN, May 1984).

The bugs kept coming anyway. One immigrant taught the cities, too, how cruel alien pests can be. This insect, a beetle, arrived sometime during the Depression as unwanted cargo buried among logs shipped here from Europe. The beetle, in turn, carried its own stowaway, a fungus that had been discovered and isolated by Dutch botanists. The fungus turned up in Cleveland in 1930, and in following years spread throughout the country. Scientists called it *Ceratocystis ulmi*, but soon most Americans knew it by its common name, Dutch elm disease. The fungus has destroyed half of the American elm population.

In recent decades, the world's pests have spared the United States any nationwide infestations and epidemics. But the pressure continues to build. Jets now bring international travelers to the heart of the nation, close to farms and ranches. By 1990, the number of international airline passengers arriving here will grow to nearly 43 million, from about 27 million in 1984. With them come the pests. Consider the Port of Miami: inspectors there intercepted nearly 8,000 important insects and other pests in 1986, more than twice what they stopped in 1978.

The bugs keep coming, some for a first visit, others returning for fresh sorties. In March, for the second time in the past three years, the Medfly turned up in Miami. Five adult male flies were found in the first

Erik Larson, a former Wall Street Journal *reporter, is currently a free-lance writer based in Baltimore.*

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Florida oranges are hit by citrus canker; it threatened millions of trees.

Among pests APHIS guards against is the Caribbean fruit fly (below).

White Mediterranean garden snails infest nursery stock in San Diego.

Notorious Medfly (left) has caused havoc since it infiltrated in 1980.

Asiatic cockroach, a recent invader, is an urban, not agricultural, pest.

Mexican bee mites (above, in the throat of a honeybee) have spread from Texas hives to ten other states since 1984.

week and one larva was discovered several days later, triggering a two-stage attack: four doses of sprayed malathion, followed by the release of 20 million radiation-sterilized male flies per week to stymie any breeding survivors. APHIS assumes that the flies arrived as larvae in fruit. Florida is now also the battlefield for the agency's assault on citrus canker, a disease of citrus trees. The treatment is "roguing," cutting down the infected trees and burning them, sometimes with flamethrowers.

Flies, moths, worms—and "killer bees"

Mike Shannon lists some of APHIS' other recent problems: a Mexican fruit fly found in San Diego late last year; apple ermine moths that are now in Washington State; Egyptian cotton worms found infesting a greenhouse in Ohio; an infestation of gypsy moths in Colorado, discovered late last year. And of course the "killer bee." That tabloid nightmare is coming closer. This bee, more formally known as the Africanized honeybee, turned up briefly in Kern County, California, in June 1985 after apparently stowing away on some oil-drilling pipe shipped up from South America. It was eradicated. Far more worrisome is the bee's natural migration—about 200 miles per year—toward the United States. Africanized honeybees were recently spotted in Mexico after they had crossed the border from Guatemala, and may reach here by 1990.

Many more pests may have come knocking but been repelled by the efforts of APHIS. The problem is, how can anyone know? "In this job, it's hard to prove you've done anything," says Shannon. "It's hard to prove a negative—that you've kept something out."

It is at the baggage stations that APHIS inspectors such as Ramírez come face-to-face with the people who bring in outlawed food. The United States allows entry to a lot of foods—breads, hard cheeses, fruit preserves—but there are many that it does not allow: fresh fruits, meats, plants in soil, milky cheeses from a foot-and-mouth-disease country, live snails. The inspectors watch most closely for travelers from the Caribbean, Africa, Asia, the Middle East and southern Europe, especially those who come armored with huge suitcases and boxes tied with string. Inspectors have learned from experience and from established APHIS profiles that such travelers may bring in large quantities of edibles. For many of them, food has a significance well beyond simple nutrition. Their luggage offers the inspectors a glimpse of cultures where foods and spices are thought to heal or to have mystic powers.

Ramírez, at his station in the American Airlines terminal, steps out to help a woman from a Jamaican flight lift her suitcase onto his supermarket-style conveyor belt. She is small, dressed in pink, and her suitcase, if stood on end, would come to three-quarters of her height. "What have you got in here, your family? I can hardly lift this," Ramírez laughs. "Oy, God! What did you pack in there?"

She was born in Jamaica, but is a 40-year resident of the United States. She is also a walking grocery store. As she opens the bag, scents of spices and hot peppers burst forth. She has fresh Jamaican peppers ("They're hot, hot, hot. You touch your eyes now, you'll go blind," says Ramírez), dried thyme still on the branch, dried mint, dried marigold, dried cacao leaves, kola nuts, ginger, cassava bread, brown sugar, avocados and cooked akee, a tropical fruit.

Ramírez confiscates only the kola nuts and the nine cans of condensed milk, which was produced in Holland and therefore could carry the foot-and-mouth-disease virus. If produced in Jamaica, the milk would have been allowed.

Food can also be a way to reach out and touch someone. Consider a Liberian minister studying here, who arrives carrying three suitcases packed with palm oil, kanya (peanuts and farina mashed together), fried and processed fish, palm butter, golden plums and a dozen other parcels. He brought the food from friends and relatives for himself and for other friends and relatives here. He explains: "The purpose of the food is not just eating, you know. It establishes some kind of tie with the folks back home. If you're homesick, as you eat the food you think of the good times you had and it helps you to hurry up and go back home." The clergyman must give up only the plums and does so willingly.

Others wage a little warfare first. When Ramírez tried once to confiscate a bag of mangoes from a Caribbean woman, he wound up in a tug of war. When the woman realized he was winning, she grabbed a ripe mango, cocked her arm and let him have it in the chest, splattering mango everywhere.

Voodoo curses: an occupational hazard

Several angry Haitians even put voodoo curses on Ramírez's soul. One pulled out a brightly dressed voodoo doll and shook it at him, rattling the seeds inside. He confiscated the doll. Seeds, without proper identification, aren't allowed.

Ramírez can fine travelers $25 for not declaring fruit or meat, or $50 for obvious tries at smuggling. He says most of the people he sees lie to him, or check the NO box on their declaration forms, even when they have contraband. "It makes it sad that you can't trust people," he comments. "Sometimes that carries outside the job. I'm less trusting now of people than before I started. People lie through their teeth all the time. Sometimes people tell you something outside of work and you wonder, are they telling the truth or lying."

At Miami airport, traveler from Central America must give up the mangoes, but keeps other produce.

Prohibited agricultural products taken from arriving passengers are shown at San Francisco airport.

Smuggling is common and the techniques vary from crude to sophisticated. In Miami, inspectors seem to come across more than their share of inventive smugglers. One spotted a man whose coat seemed just too stiff in back. The man had sewn a living, four-foot citrus tree inside.

"A lot of it is just gut feeling," says Kenneth Bedat, working one of the conveyor belts in Miami International Airport. He is a big blond man with the barrel-deep voice of a radio announcer. "Once you've been around awhile, you just look at 'em—the way they look at you, the way they don't look at you, the way something's packed." He also enlists the aid of young stoolies. "I'll tell you the truth, I'll get down and talk to the little kids," he says. "I'll ask the kids where the stuff is. The mothers will start to answer. I say no, no, no, just the kids. But you gotta talk to them about their boyfriends or their girlfriends, you know, just play with them. And they will cut loose with everything that's in every one of those bags."

There are hazards to this job. "You gotta be careful when you reach down in bags like this," he says, patting the clothing in the suitcase before him and reaching gingerly between the layers. "Sometimes you get broken glass in there. Sometimes you reach in, you'll grab razors and stuff, accidentally."

APHIS has had mixed success in adapting high technology to the job. X-ray machines proved effective in Puerto Rico and Hawaii, but a sniffer, a cumbersome device that can sense the carbon dioxide given off by fruit and meat in baggage, didn't do so well. For one thing, the machine needs fresh air to work, and there isn't much in a crowded terminal. And, while it detects fruit well enough, it has a problem distinguishing meat from another common souvenir: dirty laundry. APHIS benched the machine.

Although improved machines are being tested all the time, every airport has certain flights that yield so much food and so many scents that human inspectors work best, bringing their wits and five senses to bear.

Among items are dried pork from Thailand, canned carabao meat from the Philippines, snails from Italy.

Sniffed out by beagle named Sherlock, passenger at San Francisco airport is searched for contraband goods.

While working one such flight, Gerard Covino, a San Francisco inspector, finds himself a real-live smuggler.

The woman and her two sons approach with one large suitcase, two large boxes and four carry-on bags. Covino spends about ten minutes probing maybe 50 pounds of food. At last there is one bag left, a brown vinyl overnight case. He just starts to go through it when he spots something. "What's that?" he asks.

"My bra," the woman says. She reaches in to push it aside.

"No, no. Let me see what's inside it," says Covino. "Open it up. Open up." Again the woman tries to rearrange the contents of the case.

"Let me see! Come on," insists Covino, his voice getting louder.

"Yeh, I open up," she says. Her voice grows deeper. If a storm cloud can ever be said to pass over someone's face, it can be so said now.

The cups of the bra have been pinned shut. "What's this?" Covino asks, pulling out the pins and, along with them, a couple of dozen lanzones, tiny tropical berries a bit larger than crab apples and, as a known host to the Oriental fruit fly, prohibited.

"Ohhhhh!" she says, looking shocked. "Lanzones!"

"How'd they get in your bra?" Covino asks.

"Somebody put them there."

"Know what? That's going to cost you some money."

"Somebody put them there!" Her voice changes, more coquettish now. "But not me, I'm sure."

Covino fines her $50. Her son pays the bill.

Augmenting the work of human inspectors and high technology, APHIS also relies on eight beagles—one of them named Dr. Watson. At the command of "KILL!" he won't. At 20 pounds, his biggest enemy is falling luggage. "I have to be careful about that," says Mike Simon, 31, his boss. As the morning's flights arrive, he gets "Doc" Watson from his truck. (Another beagle, Sherlock, works the earlier shift with another handler.) Simon vigorously rubs Doc Watson's ears and sides. "Get fired up! Get fired up!" He gives the

Mexican darkling beetles turned into jewelry (meant to be worn alive) were seized by Miami inspectors.

dog a quick walk around the back of the terminal building, then slips on Doc Watson's uniform, a green coat with white letters. On one side it reads "Agriculture's Beagle Brigade"; on the other, "Protecting American Agriculture." "His tail is up, you can tell he's happy," says Simon. He talks about managing Doc Watson in much the same way an executive might talk after a course in human relations: "Motivation moves down the leash."

With the beagle out front, his nose rising and falling, the two make their way around one of the baggage carousels. From time to time the dog sticks his head deep inside a shopping bag. When he smells contraband, he sits down and looks up at Simon with big watery brown eyes. More precisely, the dog looks about halfway up Simon at a small green pouch strapped to his waist. This is where Simon stores Doc's salary, bits of dog food doled out each time he makes a good "hit." Given only one meal a day, he makes up the rest of his ration this way.

Doc Watson thinks he has got something in the attaché case of a businessman. He sits.

"What kind of food do you have in there?" Simon asks. He seldom asks a yes or no question, for no is too ready an answer. Surprised, the man bends down, opens his briefcase and displays an apple. Although just one piece of fruit, this find is significant. "We never would have gotten him without the dog," says Simon, who explains that businessmen don't fit the profiles of travelers known to bring in food. The dogs, he says, are especially useful, therefore, on European flights.

As Doc Watson makes his rounds, wisecracks follow. "Oh, a guard beagle!" exclaims one woman. "Watch out," quips an American at the carousel; "it's trained to kill." But children reach out with splayed fingers. Two Japanese women take turns snapping pictures of each other posing with the dog in their laps.

It is Doc Watson's appeal, not his nose, that causes the downfall of a German student. He spots the beagle and comes right over to scratch his ears and belly. Doc stands on his hind legs to greet him. "Reminds me of my dog back home," he says. "Only mine is black." The young man whips a wicker basket off his back and pulls out a little something for the dog. "Can I?" he asks. "No," says Simon—then he does a double take. "What is that?"

"A hot dog."

Contraband.

"What else do you have in there?" Simon asks. Final score: two hot dogs and a package of salted meat.

Sherlock practices his San Francisco training; here he's still learning to sniff, but not touch, baggage.

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Churned out in 1930, sheet music capitalized on miniature golf's overnight rise to popularity.

By Constance Bond

We couldn't stop playing to save our soles

Miniature golf began as a craze, but over the decades it has gently seduced Americans and become part of our collective identity

The year was 1930 and the fad sweeping the country was miniature golf. It bears mentioning that a fad at the end of the Roaring Twenties was more than just dinner-table conversation. American society was in an addictive mood, and this was the decade that had spawned dance marathons, flagpole sitting and the Ouija-board mania—all increasingly frantic reactions to the times. Coming as it did the year after the Great Crash, miniature golf was the grand finale.

And the perfect palliative, then as now. As the problems of ordinary life mushroom out of manageable proportions, here is a place where everything is brought down to less-than-size: not just the putter you swing and the length of the greens, but also landmarks from throughout the world—seated Buddhas with tunnels drilled through their kneecaps, recumbent sphinxes with passages between their paws, castles fronted by drawbridged moats and, nearly always, that infernal whirring windmill with the trick vanes.

An unobtrusive—if seedy—presence

After peaking in 1930, the game bottomed out like the rest of the economy, and except for a revival during the '50s (spurred by the growth of the suburbs) it never really made a comeback. Rather, through the years the little links maintained an unobtrusive and homey—if occasionally seedy—presence as a dense architectural landscape developed around them. But people always kept coming by. After all, what better activity can there be on a warm summer evening for teenagers on a first date, or for a family doing the *Father Knows Best* routine?

Now we have a book that memorializes, in pictures and in words, this ubiquitous American pastime. *Miniature Golf*, available this summer from Abbeville Press, presents the photographs of John Margolies, who traveled the country to document as many miniature courses as he could find. The text, by Nina Garfinkel and Maria Reidelbach, answers the question we occasionally asked as we drove off for hamburgers and shakes: Who dreamed up this game anyway?

It was James Barber, the owner of a country estate in Pinehurst, North Carolina, who came up with the idea. In 1916, just for fun, he laid out a small course in his garden, a pleasant diversion for houseguests.

It took a decade for the game to be exploited by a pair of high-rolling promoters, who built a pocket course on the roof of a skyscraper in New York City's financial district. They hoped to attract statistic-frazzled Wall Street types during their lunch hours.

Their small business was a hit, but a technological problem stood in the way of expansion: the course needed a surface that could stand up to the abuse of countless shuffling feet, caroming balls, and enraged

Color photographs by John Margolies/Esto

Golf 'n' Stuff's cheery monstrosity in Ventura, California, scrambles "Oriental" elements. The links bring the world's landmarks down to size, sometimes transforming them into strange visions in the process.

whacks from the business end of a putter. The solution lay with an Englishman in Mexico, the owner of a cotton plantation. Four years earlier, he had perfected and then patented a compact cottonseed-hull surface. Now all he needed was a market.

It was time to cut some deals. First, the New Yorkers wrote a check to the Englishman, and the number of cottonseed-paved rooftop minicourses grew to 150. Then Garnet Carter, part owner of a resort in Georgia, got into the act. His wife had designed a "Tom Thumb" course; when everybody wanted to play, Carter sensed a winner. After buying rights to use the cottonseed-hull process for $65,000, he located a company to manufacture hollow logs, tiny houses and other miniature-golf hazards and the courses were sold nationwide.

The game sprung up almost overnight

By 1930, there were 3,000 Tom Thumb links and more than 20,000 other Mom-and-Pop operations—almost overnight, the game was everywhere. Its success was so great that Hollywood studios, with movie attendance down nearly 25 percent, ordered their stars not to set foot on the competition's turf.

There was, of course, no way the momentum could have lasted; for one thing, we would have run out of vacant lots long ago. Yet the fall was fast, even for a fad. Not only Hollywood, but local residents who didn't like the noise of late-night players, and finally Will Rogers ("There is millions got a 'putter' in their hand when they ought to have a shovel") turned against the game. Seems as though only one person knew the score: in October 1930, when miniature golf still looked like an industry analyst's dream, Garnet Carter sold his Tom Thumb manufacturing business at a very tidy profit.

Authors Garfinkel and Reidelbach love their subject, and they describe the history of miniature golf with fond exuberance, driving home every imaginable pun. For them, the game is an American art form. "Europe may have its centuries-old traditions of landscape architecture," they proclaim, "but America has miniature golf." Well.

The fact that almost all of us have played the game, the authors argue, qualifies miniature golf as part of the collective consciousness of America. They may have a point—try asking a European if he can hit a ball so that it passes between the vanes of a turning windmill. It would be a great line in one of those old war movies, where the German spy with the flawless Midwestern accent is posing as an American G.I. "Ever manage to hit a ball through the windmill vanes?" a savvy fellow soldier from Detroit casually asks him. And caught unaware, the imposter answers, "Nope, never even been to Holland." Bingo.

Lampoon of drawing-room mayhem appeared in *Judge* at height of miniature golf's popularity in 1930.

The first miniature golf course, 1916, was laid out in the private garden of a North Carolina estate.

Hollywood execs banned stars from setting foot on the competition's turf, but Fay Wray teed them off.

Cheesecake shots like this, taken at a suburban Chicago links, fueled criticism of upstart game.

Laughing Buddha surveys the cosmic scene at Golden Dragon Golf in Myrtle Beach, while at other links, the Enlightened One sits in deep meditation.

Solemn visitor from Easter Island graces a course in Key West.

Hooded snake charms putters at Jockey's Ridge Miniature Golf in Nags Head.

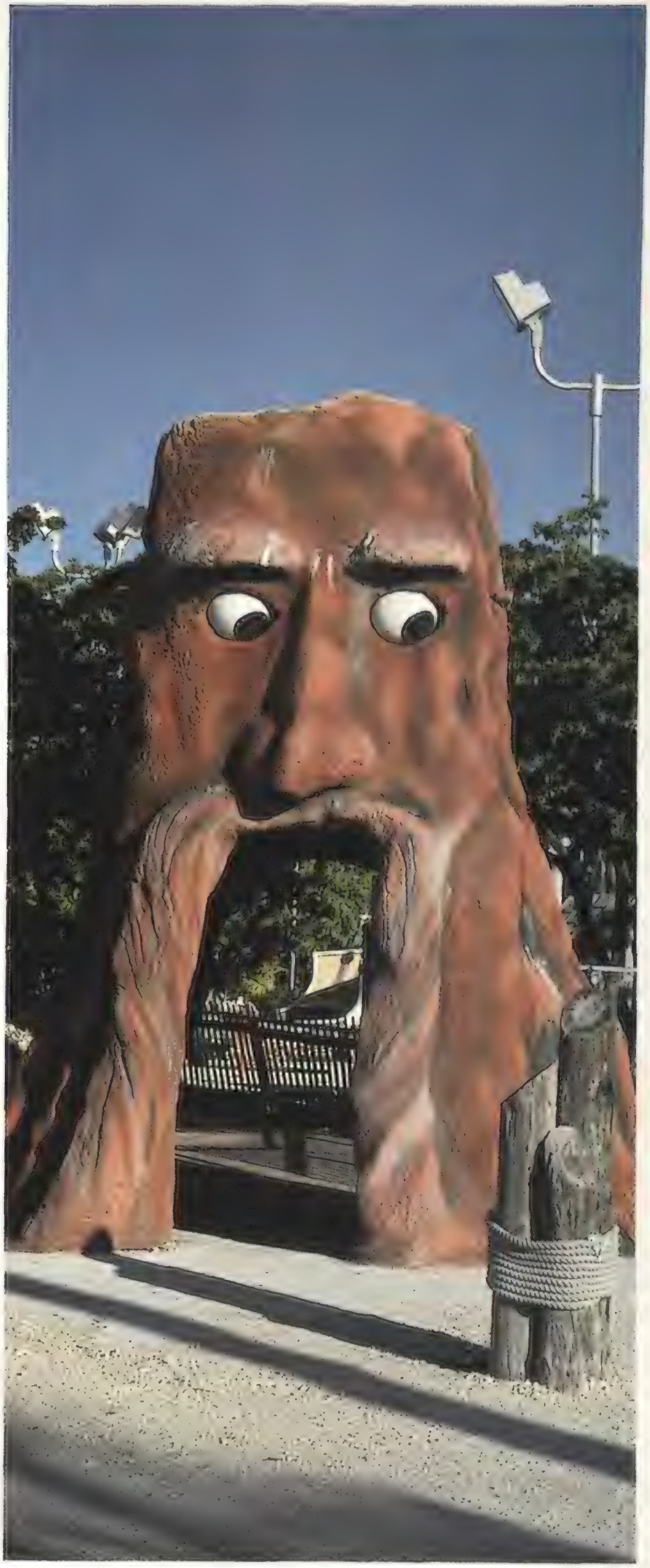
The dreaded windmill with the whirring vanes: An American icon?

Haunted house is at Castle Amusement Park in California.

Temple to candy—cherry-domed, its spire an inverted ice cream cone—is in Fort Lauderdale.

Patsy the Whale, in Hyannis Port, is one of several funky fairway animals created by T. J. Neil.

The stuff of nightmares: gaping-mouth gateway at a Key West course stops tykes in their tracks.



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During World War I, Army officers in the Friedmans' cryptology class pose for camera in Aurora, Illinois.

Breaking codes was this couple's lifetime career

By James R. Chiles

William and Elizebeth Friedman were roped into an odd profession by a wealthy eccentric and became America's premier cryptologists

Toward the end of World War I, the British Army began manufacturing thousands of small cipher machines, "Pletts Cryptographs," for use by the Allied forces. The British asked the American forces to use them as well. No one in the French, British, or American military had been able to break the ciphers; the machine had a mechanism that regularly altered the ciphering scheme, so the first *a* might be turned into an *f* and the next *a* into an *r*.

Just to be sure that it was safe from enemy codebreakers, the American military passed it on to a remarkable husband-and-wife team in Illinois for testing. William and Elizebeth Friedman received a package with five telegram-length messages. It took them all of three hours to break the lot, after which they returned them to London, solved. The first of the five messages read: "This cipher is absolutely indecipherable."

Few ciphers were ever indecipherable to the Friedmans. By the end of his life, William Friedman was recognized as the greatest maker and breaker of secret messages in history—the Harry Houdini of codes and ciphers. Repeatedly, he accepted challenges to solve "unbreakable" ciphers, and succeeded. The papers he wrote brought cryptology, an ancient skill as obscure as witchcraft, into the scientific age. The team he trained and supervised broke into Japan's highest diplomatic cipher just before World War II; not only did the group penetrate the secret, it built a deciphering

William (seated on the right) and Elizebeth (seated in center) organized the group into a biliteral cipher: those facing front represent *a*'s, those sideways, *b*'s, spelling Bacon's phrase, "Knowledge is power."

machine that worked as well as Japan's cipher machine. Elizebeth Friedman provided exceptional assistance to the U.S. Coast Guard and Navy, unraveling secret messages from rumrunners during Prohibition, narcotics traffickers during the 1930s and enemy agents during wartime. True to the shadowy world of intelligence work, the pair shunned publicity and avoided discussing their work—even with each other.

Neither had planned a career of codebreaking. In keeping with the strangeness of their profession, it all began at a peculiar place called the Riverbank Laboratories. The Riverbank estate, located on the Fox River in a small suburb west of Chicago, was the magnificent hobby of Col. George Fabyan, an eccentric millionaire who had retired from cotton trading early in the century. Here, on 600 well-kept acres, Fabyan's stable of hired scientists pursued whatever he found interesting or worthwhile, from sound waves to cryptology to plant genetics. In the evenings, they enjoyed the genteel life of the "minor idle rich," in Elizebeth's words. Other employees tended his greenhouses, livestock-breeding operation, Dutch windmill, Japanese garden and caged vegetarian bears. A monkey and other pets had free access to Fabyan's house, which was also notable for its furniture hung from the ceiling by chains.

Fabyan, a large and loud man with iron-gray hair who wore frayed formal clothes in the city and a sort of horseman's outfit in the country, "had great natural gifts of energy and dynamism," the Friedmans wrote later. "He also had the trick of parroting other people's jargon; his conversation was usually impressive—superficially, anyway."

In the spring of 1915, Fabyan went hunting for a geneticist to improve crop strains. A professor at Cornell suggested William Friedman, a graduate student in genetics. Friedman, who had been born to a Russian Jewish family in 1891 and brought to America as an infant, was preparing for a future in biology. When Fabyan offered him the job, Friedman asked him what he raised on his estate. "I raise hell," Fabyan replied. Friedman signed on at a hundred dollars a month as head of Riverbank's Department of Genetics and began work the following September, taking up quarters in an upper floor of the windmill. In a short time Fabyan had him planting oats by the light of the moon, to see whether the phases made any difference.

The other half of the Friedman team, Elizebeth Smith, graduated from Hillsdale College in Michigan in 1915 with an English degree, and a year later sought work in Chicago. At the Newberry Library, a staff member mentioned to her that a George Fabyan was looking for someone to study Shakespeare and offered to call him at his Chicago office. Fabyan arrived in his chauffeured limousine and insisted that Elizebeth come to the estate immediately. "He was the kind of man who did not take 'no' for an answer," she would

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☐ Other _____

While an undergraduate studying biology at Cornell, William did summer fieldwork on sex mutations and aberrations in plants.

reminisce. That evening she met Elizabeth Wells Gallup, a woman who had convinced Fabyan that Francis Bacon was the real author of Shakespeare's plays and sonnets, and that Bacon had hidden a number of secret messages inside the original printed copies. Elizebeth agreed to assist Mrs. Gallup in this unusual project.

And so began the Friedmans' long involvement in the esoteric world of ciphers and codes. For most of the rest of us, here's the difference between the two: in a typical cipher (such as the Pletts Cryptograph solved by the Friedmans in 1918) each letter of the original message is changed into another letter or symbol according to some orderly scheme. To decipher the message, it helps to know that *e* is the most frequently used letter in English. With additional knowledge of the language and guesses based on the context of the emerging message, the rest of the alphabet follows.

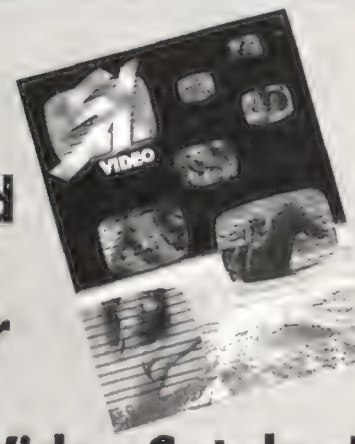
Most ciphers, however, are vastly more complicated than a single substitution: *e* will be represented by different symbols at different points in the message. A basic way to accomplish this is to assign each letter of the alphabet a number: *a* is 1, *b* is 2, and so on. Then we add a key, a regularly repeating group of characters or words superimposed onto the message. Say we want to send the word "trouble," and our key is "fast." It works like this:

Message:
20(T) 18(R) 15(O) 21(U) 2(B) 12(L) 5(E)
Key:
6(F) 1(A) 19(S) 20(T) 6(F) 1(A) 19(S)
Total them:
26 19 34 41 8 13 24

. . . and you have a cipher that your nosiest neighbor probably couldn't break. Your cousin on the other end will know the key, subtract it, and then distill the message. But it wouldn't even make lunchtime recreation for a cryptologist, who would aim a barrage of statistics at it and solve it in minutes.

A code is different. A typical code takes ideas in the message—words or even whole phrases—and changes them into something else, usually groups of numbers taken out of a codebook resembling a small dictionary. To compose a coded message, the

The author contributes regularly to these pages and recently wrote on titanium and research balloons.



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sender first writes what he intends to say ("Attack is imminent") and then looks up the words in his codebook. "Attack" is 1140, and "imminent" is 4539. And that's his message: 1140 4539. To further confound the enemy, the sender might scramble the signal by using a key to encipher those numbers, by switching around the order, or both. The receiver must have an identical codebook and know anything extra the sender has done to scramble the number groups.

Codes and ciphers go back many centuries. Ancient Greek commanders scrambled messages by wrapping a strip of parchment or leather around a tapered staff in a tight spiral and writing their message down the length of the staff; unwound, the strip displayed a jumble of illegible letter fragments. A few centuries later, Julius Caesar wrote to associates in a simple cipher that took each letter of the message and substituted the letter three places farther down in the alphabet. Islamic people were the first to figure out how to attack ciphers in an organized way. During the Renaissance many European countries began setting up full-time codebreaking bureaus, called black chambers, to try to read each other's messages.

Eccentric millionaire George Fabyan built up a brain trust at Riverbank.

Newly married William and Elizebeth stroll at Riverbank, where they met.

In 1623 Francis Bacon contributed a new kind of cipher to this busy scene, one that used only the letters *a* and *b* to represent the entire alphabet. In the table he set out, *aaaaa* stood for A, *aaaab* for B, *aaaba* for C, and so on. He called it the biliteral alphabet, and described how it could be disguised in an ordinary paragraph by using two different typefaces: one typeface representing *a*, and the other *b*.

Which brings us to Elizabeth Wells Gallup's Bacon-as-Shakespeare theory. It rested on two piers: Bacon had indeed invented the biliteral cipher, and the original printed folios of Shakespeare's plays employed an odd variety of typefaces.

Mrs. Gallup believed herself able to take printed lines from the plays and identify each character as either an *a* or a *b* typeface. Consulting the table that Bacon had published in 1623 she transformed each group of five *a*'s and *b*'s into a letter of the alphabet. The revelations she concocted were voluminous—one-fifth the

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length of the plays themselves—and sensational. Bacon, she claimed, not only wrote the plays but also was an illegitimate son of Queen Elizabeth I and the rightful heir to the throne. She convinced Fabyan to spend thousands of dollars digging holes around London, hunting for buried manuscripts. (Decades later, the Friedmans presented evidence that demolished the hidden-message theory. The peculiar typefaces were due to the economical habits of English printers, who preferred to repair old type rather than replace it.)

William Friedman spent time on the Bacon project as a photographer, taking close-up pictures of typefaces. Then, over the winter of 1916-17, with the approach of war, he turned over his genetics work to an assistant and joined Elizebeth in studying everything they could find on secret writings. Not much was available: the American literature, for example, consisted of a couple of short works by military men, and two articles and a story by Edgar Allan Poe. "We had a lot of pioneering to do," Elizebeth wrote later. "Literary ciphers may give you the swing of the thing, but they are in no sense scientific. There were no precedents for us to follow." In May 1917 the two married.

Meanwhile, Fabyan was bringing in coded diplomatic messages from unfriendly powers; he had offered his services free to the government, which had accepted. For almost a year, until the creation of the Army's Cipher Bureau, Riverbank was the only organization in the country capable of working out secret messages.

Among the most interesting problems to arrive at the large cottage where the Riverbank codebreakers worked were the cases involving the Hindu plotters. The first case was delivered personally by an official of Scotland Yard, who carried an attaché case packed with dozens of intercepted letters. For several years the Germans had been encouraging the aspirations of independence held by Indian citizens, on the theory that any trouble Indian radicals could stir up would siphon British strength from the war. Some of these radicals lived in the United States, and they had been passing cryptic messages around regarding arms shipments and internal politics.

One of the Hindu systems the couple broke into was a code that used numbers to indicate words and letters from a book that both sender and receiver had available. The cryptic number groups came in clusters of three, and the middle section always contained a 1 or a 2; that indicated a two-column page, probably a dictionary. The frequent use of some number groups indicated certain common words like "the" and "of." The first break was 99-2-14 in the code

Landmarks at Fabyan's Riverbank Estate near Geneva, Illinois, included spiderweb, lighthouse, windmill (background) where William lived.

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William Friedman sits at the keyboard of the unwieldy AT&T Printing Telegraph Cipher, claimed to be unbreakable; he broke it in six weeks.

—page 99, the second column, the 14th word—which they concluded from context was "you." That led to 99-2-17, which the couple guessed was near enough in the dictionary to be "your." Eventually they managed to make out nearly every word without having the actual dictionary at hand. Still, it was important to somehow obtain the dictionary for the upcoming trial of 135 Hindus in San Francisco. The Riverbank group polled large numbers of booksellers without results. Finally, having arrived in San Francisco to testify at the trial, William went into a university bookstore in Berkeley. He described what he was seeking (which must have been quite interesting in itself), and an employee dug around and produced the second volume of a German-English dictionary published in 1880. A quick check of the pages showed that this was, indeed, the book.

By late 1917 the Army had created its own Cipher Bureau, and the flow of intercepts to Riverbank ended. Fabyan, determined to stay in the center of the action, arranged for the Friedmans to conduct classes in cryptography for Army officers.

Soon after the classes ended, William accepted a first lieutenant's commission in the Army and left for France. He spent the last five months of the war with General Pershing's staff, concentrating on breaking into the German codebooks. It was enough time to learn some important things about how armies employed codes and ciphers in wartime, and what could go wrong. For example, he observed that the German messages often began and ended with ritualized phrases, and that when a new code or cipher was introduced, the enemy's clerks were most likely to make a serious error (called a "bust" in the trade), exposing the system.

The following spring, William and Elizebeth returned to Riverbank. There William returned to the studies he had started before he left for Europe, which Fabyan issued as individual volumes in his *Riverbank Publications* series. In 1920 Friedman finished No. 22, titled *The Index of Coincidence and Its Applications in Cryptography*. This booklet, says David Kahn, author of *The Codebreakers*, "must be regarded as the most important single publication in cryptology. It took the science into a new world." Friedman went beyond simple counts of letter frequency to discover techniques for applying statistical methods to cryptanalysis.

If you take any two lines of English text and place one above the other, so that each letter lines up with the one above or below it, there will occasionally be places where the same two letters appear in a vertical column. Friedman found that, for English, this coincidence consistently occurs in 6.67 columns out of every 100, or about seven percent of the time. He also found that this rate, the Index of Coincidence, is unique for each language. Such information can be very useful to a cryptanalyst with several enciphered messages from the same source. Usually these ciphers would be created using the same key, but the sender will have enciphered each message by starting at a different place in the key, according to some rule previously arranged between him and the receiver. Using the Index of Coincidence, the cryptanalyst can place the messages one above the other and, by sliding them back and forth, find the right "fit"—an indication that the key in the top message is vertically aligned with the same key in all the messages below it. Once the messages are aligned according to their key, he can work from message to message knowing that each letter in a vertical column has been enciphered with the same key letter as all the other letters in that column.

Shortly after this breakthrough the Army offered to employ the Friedmans as civilian "code experts" for a six-month trial period. With a few wary glances backward at Fabyan, wondering whether his tenacious

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The best way to appreciate the codebreaker's trade is to attack a secret message. The following cipher uses letter-for-letter substitution, and all punctuation and word spacing have been preserved. You will have to tabulate the cipher letters by how often they occur, and then guess at the plaintext letters they stand for. The way to do this is to compare the frequency of the cipher letters to the frequency of letters in common English. On average, the most common letter in English is E, followed by T, O, A, N, I, R, S, H, D, L, U, C, M, P, F, Y, W, G, B, V, K, J, X, Z and, finally, Q. Try to identify the most common letters first, then fill in the rest by context.

Z S O U O U D U D E G V F K A K L P O C D L X F C Y V O U S .
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ .
R B Z P K C ' Z D U U B E F Z S D Z D V V F C Y V O U S E B U Z
_ _ _ _ _ _ ' _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
A K V V K I Z S F V F Z Z F L - A L F M B F C N X N K B C Z U .
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ - _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ .
A K L O C U Z D C N F , D C D B Z S K L C D E F P F L C F U Z
_ _ _ _ _ _ _ _ _ _ , _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
J O C N F C Z I L O Y S Z I L K Z F D A B V V - V F C Y Z S
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ - _ _ _ _ _ _ _
C K J F V Z O Z V F P Y D P U R X I O Z S K B Z B U O C Y Z S F
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
V F Z Z F L F D U O C Y V F Z O E F . Z S O U O C N L F P O R V F
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ . _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
A F D Z S D U C K Z R F F C P B G V O N D Z F P . Z K
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ . _ _
D G G L F N O D Z F I L O Y S Z ' U D N S O F J F E F C Z , Z L X
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ ' _ _ _ _ _ _ _ _ _ _ _ _ , _ _ _
I L O Z O C Y D C K Z F Z K D A L O F C P I O Z S K B Z
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
B U O C Y Z S F V F Z Z F L F .
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ .

(For the solution, see page 152.)

grasp would reach to Washington, they left Riverbank for good and started military contract work in Washington, D.C., early in 1921.

In 1922, the War Department hired William permanently as chief codebreaker. Over the next few years he solved several "unbeatable" ciphers produced by machines. One of these, developed by Edward Hebern, foretold the hellishly complicated cipher machines that would dominate the next two decades. It used five movable rotors to scramble electrical signals between a keyboard and a set of glow lamps showing the enciphered letters. William had to determine the ciphering scheme, and then reconstruct much of the internal wiring. "He was discouraged to the point of blackout," Elizebeth said later. "Probably he sat for six weeks before he thought of a way to attack it. . . . It was all resolved in the end by the Index of Coincidence."

The Hebern solution was particularly important, says Louis Kruh, coauthor of *Machine Cryptography and Modern Cryptanalysis*, because that machine "introduced a whole new concept of encipherment. It was the forerunner of any decent cipher machine between then and beyond World War II. Some of the report that he wrote on the solution is still classified today."

The latter part of that decade was exciting for Elizebeth. Her codebreaking began in earnest in 1927 as a "special agent" on loan from the Department of Justice to the Coast Guard, which was struggling to enforce the Volstead Act against a flood of smuggled shipborne liquor from the Bahamas, Canada and elsewhere.

The rumrunners' system required radio communications for rendezvous points, warnings and prices. It was this encoded and enciphered radio traffic that Elizebeth attacked. The early messages were elementary and quick to break. But as time went on and profits climbed, larger and more sophisticated syndicates took over the distribution network, and coding systems became more and more elaborate. In the first three years she and her assistants solved 12,000 messages using dozens of different schemes. In 1934 her decoding, and the detective work it inspired, cleared up a major diplomatic problem between the United States and Canada dating to 1929. She proved from old telegrams that the *I'm Alone*, a Canadian-flag schooner shelled and sunk by the Coast Guard in the Gulf of Mexico, had been secretly owned by an American smuggling ring.

Elizebeth, now working for the Treasury Department, was a star witness in a large and expensive trial in New Orleans of top officials of a Canadian outfit that controlled most of the liquor smuggling via the Gulf of Mexico and the Pacific. She deciphered and decoded cryptic radio messages that made prosecution possible.

The Friedman family, which by now included a son and a daughter, was aware that their mother's contact with organized crime had its dangers. Recalls daughter Barbara Atchison, "I remember Dad jesting once, when Mother was late getting home, that she might have been taken for a ride." And, in fact, while the *I'm Alone* case was under way, agents of the Treasury Department kept her under constant protection. Elizebeth broke open the code-ciphers used by narcotics smugglers. Her contributions to several sensational trials, and the associated convictions, earned her much unwanted attention from the press: "U.S. Woman Helps Smash Drug Ring," and "Key Woman of the T-Men," read two headlines.

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War came and her work changed again. She devised a code system for William (Wild Bill) Donovan as he was organizing the Office of Strategic Services, and deciphered messages from German spies in Allied lands.

All this time William had been equally busy, but his work was well hidden from public view. In 1930 his responsibilities changed abruptly from the bookish work of composing codes. It was prompted by the closing of the Black Chamber, a cooperative codebreaking effort of the State Department and the Army that had evolved from the Army's old Cipher Bureau. The Black Chamber had decoded messages between Tokyo and the Japanese embassy, and in early 1929 Herbert Hoover's new Secretary of State, Henry Stimson, had removed his department's funding upon hearing about it. Years later, in his autobiography, he justified his action by saying that diplomats should not engage in such activities because "gentlemen do not read each other's mail." The Army quietly transferred the activities from the State Department to a new unit in the War Department, the Signal Intelligence Service (SIS). Friedman took charge as chief civilian cryptanalyst.

One of William's principal tasks was to train a new generation of experts to make and break codes, because all of the Black Chamber's personnel had dispersed. He started in the spring of 1930 with four spaces. He selected Frank Rowlett, a teacher from a small town in Virginia; Solomon Kullback and Abraham Sinkov, mathematicians from New York City; and John Hurt, the nephew of a congressman and an expert in Japanese.

The new team combed the files of the Black Chamber for useful information on Japanese cryptology. They read Friedman's booklets and worked through problems he concocted. He gave them assignments such as solving the Hebern cipher machine. "His teaching was such that we developed on our own," recalls Abraham Sinkov. "He just looked in from time to time to see how we were doing."

They operated on slim budgets—bringing their own pencils and writing on the back of old weather reports to save paper—but within two years they had progressed enough for Friedman to present them with the real thing: encrypted radio communications between Japanese diplomats.

By this time the Japanese knew that America had been reading secret diplomatic radio traffic. To protect its highest-level communications, Japan quickly switched to the new electromechanical cipher machine, "Angooki Taipu A," or "Red" to the Americans. It used a combination of wheels, rings and a rotor to scramble clear messages into a complex cipher. In 1935 the Army ordered Friedman's group to concentrate on breaking the system; by 1936 they were able to read the messages.

The passion for cryptology spilled over into the Friedmans' home life. William created a cipher game for children called "The Game of Secrecy" and tried it out on his son, John. He printed holiday greeting cards with cipher messages.

The most inventive of these pas-

Elizebeth leaves D.C. home to testify against smugglers whose codes she cracked.

times were the progressive dinner parties hosted by the Friedmans. They divided their guests—a unique blend of codebreakers, newspapermen and scientists—into teams, and held the first course at one restaurant. "While they were eating, the restaurant owner gave them a piece of paper containing a clue about the next place to go," recalls John Friedman. "They'd go to five or six restaurants. . . . The first team to return home, won a prize."

William amused his children with enigmatic behavior. "He would come down to Sunday breakfast with six different ties on," remembers his daughter, Barbara. "He had a terrific sense of humor and whimsy, and women absolutely adored him."

Friedman had to leave most of his social life behind, however, when the Japanese decided to replace the Red machine with something much more secure. Labeled "Purple" by the SIS, the machine first contributed messages to Japan's radio circuits in February 1939. Unlike its predecessors, Purple used a type of switch identical to those used in automatic telephone exchanges to accomplish the main work of encipherment.

While dozens of others did the detailed statistical analysis necessary, William labored alone in his office on portions of the problem. He worked obsessively. The fear of failure—of what the Japanese were up to behind the screen of Purple—followed him home each night. "He'd be up until 2 or 3 in the morning," Elizebeth recalled later. "Sometimes I'd awaken and find him down in the kitchen making a Dagwood sandwich in the middle of the night." She remembered that her husband never discussed his difficulties with Purple, not even on the day in the fall of 1940 when the deciphering first succeeded. (For years, all he would tell his son, John, about his job was that he "worked for the Army.")

The team spent a total of 18 months puzzling out the mechanism and the nest of wiring from their calculations

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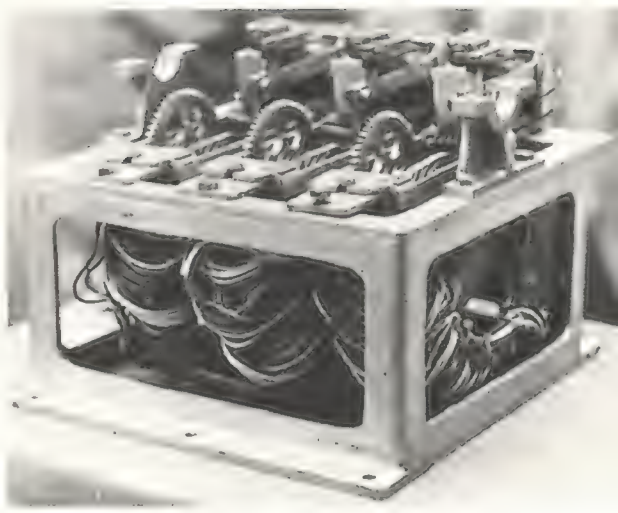
on how the original machine converted plaintext to cipher. Then, out of $684.65 worth of parts, they went ahead and built their own reconstruction of the Purple machine.

The Purple disclosures (codenamed "Magic") proved extremely valuable during the war. Ironically, says David Kahn, Magic "had its greatest effect on the war against Germany, not Japan, because we were getting a great deal of information that the Japanese ambassador in Berlin was sending back to Tokyo." For example, the ambassador, Baron Oshima, described Germany's new jet fighters in detail, and he listed German troop strength in the Balkans. Oshima even cabled a close description of the Normandy defenses in late 1943. Unfortunately, Magic did not clearly reveal the Japanese intention to attack Pearl Harbor —signals only indicated an impending crisis between America and Japan.

Codebreaking definitely changed the course of the war. The Allies made three major breakthroughs in all: the Japanese diplomatic cipher, Purple; the main German military cipher called "Enigma," which was broken by the Polish and British; and the Japanese fleet code, broken by the U.S. Navy, which made possible many American victories including the Battle of Midway. What made the breaking of Purple so extraordinary, says author Louis Kruh, is that the SIS had no pieces of the machine to study. When the team studied genuine Purple components after the war, he adds, they found that, out of all the thousands of soldered connections, "only two wiring connections turned out to have been interchanged."

Due largely to overwork on Purple, William suffered a mental breakdown at the turn of the year, and spent the next three months recovering in Walter Reed Hospital. Though the hospital recommended he return to duty, shortly afterward the Army discharged him from service. He served out the war as a civilian, organizing attacks on new cipher systems and rapidly training more cipher personnel.



Innards of "Purple": sight unseen, William's team made near-perfect clone.

"The war years were horrendous," recalls his daughter. "He was very, very involved in his work. I remember being worried to death about Dad." Attacks of depression severe enough to require psychiatric treatment or hospitalization would return again.

Wartime associates remember William as demanding and brilliant. "When working on a problem," recalls Frank Rowlett, "he was inclined to develop a plan of attack which he usually followed meticulously until the problem was either solved or it could be established that the attack would not be successful. His memory was excellent and he had a most unusual ability to grasp the complexity of a problem." Lambros Callimahos, a concert flutist who became a codebreaker in 1942, remembered Friedman as the "dapper figure with the Adolphe Menjou mustache, the characteristic bow tie, and the two-tone black-and-white shoes." Friedman was notoriously meticulous, even to the point of keeping carbon copies of handwritten notes. Judy Friedman, his daughter-in-law, remembers her first weekend visit with the family. John had forewarned her that if his father failed to criticize her language, that meant she hadn't made the grade. Throughout the weekend, there was not a single comment from William about her speech. Judy was crushed. Then, upon leaving the house, he

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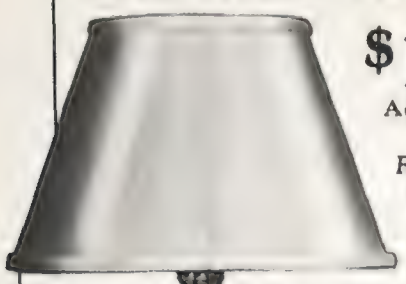

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leaned close and whispered, "My dear, you made five grammatical errors this weekend," and proceeded to elaborate on them. Nothing could have pleased her more.

After the war, the Army restored William's rank and he served as a top-ranking cryptanalyst in the various agencies leading up to the present National Security Agency (NSA). In 1956 Congress awarded him $100,000, partly in compensation for many of his inventions that were so sensitive and useful that the military had kept them off the market. One of these, a mechanism he had developed with Frank Rowlett, was the basis of the SIGABA machine, which the U.S. military used as its top-level enciphering device during World War II. The Axis never penetrated its messages.

William retired officially from the NSA in 1955 but continued to undertake various special and highly secret missions. His relations with the NSA were stormy at times; he believed the agency sometimes mistreated him and that it snooped excessively into citizens' communications. The NSA, in turn, occasionally saw him as a security risk; in 1958 three NSA employees appeared at his Capitol Hill house and carried off a stack of papers.

Elizebeth finished her professional career as a consultant for the International Monetary Fund, setting up a secure communications system there.

Toward the end of their careers (William died in 1969 and Elizebeth in 1980), the couple returned to the unlikely project that had first seduced them into the world of cryptography —the Shakespeare problem. Their incisive book, titled *The Shakespearean Ciphers Examined,* won them a Folger Shakespeare Library award in 1955. And in a classic demonstration of their life's work, Elizebeth and William Friedman included a hidden biliteral cipher on page 257 of the book. Buried in an italicized phrase, using two different typefaces, is their final verdict about the whole controversy: "I did not write the plays. F. Bacon."

In 1958, the year after publishing their conclusion that Francis Bacon was not Shakespeare, the Friedmans examine a page of Bacon's ciphers.

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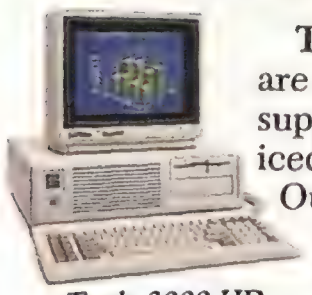

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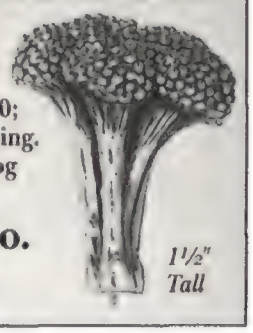

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Book reviews

Willa Cather: Early Novels and Stories
Edited by Sharon O'Brien
Library of America, $27.50

Willa Cather: The Emerging Voice
Sharon O'Brien
Oxford University Press, $24.95

The Library of America's recently issued first volume of Willa Cather's work contains five complete early books. *The Troll Garden* (1905) collects seven stories, mostly about the emotional lives of artists and musicians, including the celebrated psychological study, "Paul's Case." *O Pioneers!* (1913) and *My Antonia* (1918) are her lyrical portrayals of stolid, long-suffering women battling life on the Nebraska plains. *The Song of the Lark* (1915), which chronicles an opera singer's life and career, is Cather's most extended and rhapsodic portrait of the artist: a gravely serious, somewhat static hymn to art. *One of Ours* (1922) describes the death of an idealistic youth in World War I and reveals Cather's emergent vision of an acquisitive society bereft of the traditional values that created it and sustained it.

Sharon O'Brien, who edited this volume, has also written an ambitious interpretive biography that covers Willa Cather's life from birth (1873) through girlhood in Virginia and Nebraska up to the time of her first major literary success (1913), and discusses at length her "struggle to resolve the culturally imposed contradictions between femininity and creativity."

O'Brien neither minimizes nor overdramatizes the young Willa's stubborn insistence on adopting a male persona for four years (as a teenager, she dressed in boyish clothes, cut her hair and called herself William Cather); she understands it as a gifted woman's combative reaction against the limitations placed on her sex—the avenues traditionally closed to her. There's a vivid sense, running throughout this book, of Cather's vacillating pride in womanhood's enduring strength and her emotional need to distance herself from the dullness of housewifery. There is also her need to enter—and be accepted in—the masculine world of free expression and artistic productivity.

It's all persuasive, despite what some may call an overreliance on the approaches of feminist historians and literary critics and psychoanalytic specialists (such as "British object-relations theorist D. W. Winnicott"). O'Brien does occasionally bog down in minutiae and jargon, and her ironclad reiteration of the centrality of the mother-daughter relationship in Cather's thought unfairly colors her accounts of *all* of Cather's friendships with women.

Nevertheless, the narrow focus confers real unity, and produces many striking discoveries and insights. O'Brien's research pulls fascinating material from the letters and diaries of ancestors who provided "varying examples of female strength and competence." She finds further exemplars in Cather's great-aunt, the formidable Sidney Cather Gore ("a woman writer who . . . associated language with power"), and years later, in the circle of educated New England women that included the successful au-

Willa Cather was managing editor of *McClure's* when photographed about 1910.

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thor Sarah Orne Jewett—Cather's most admired mentor throughout her "search for a female literary tradition."

O'Brien's attention to the work itself is equally fruitful. Her analysis of the influences on Cather's early poetry is a model of scholarly economy. She usefully surveys the writer's "journalism of the [eighteen] nineties," makes interesting inferences about Cather's "fascination with women actresses and opera singers" from the short stories, and convincingly finds the strong influence of Jewett's New England tales in stories hitherto considered products only of Cather's infatuation with "the Master," Henry James.

There is also a full accounting of Cather's attraction to male models of strength and success, and what it cost her. Her years as a journalist and her repeated "pilgrimages" to Europe were assertions of her right to move in a man's world. On the one hand, she held a romantic vision of the artist as *warrior* vigorously engaged in the defense of culture; on the other, she slavishly emulated the patiently analytical prose of James at his most Jamesian (especially in her first novel, *Alexander's Bridge*, 1912). Only when Cather abandoned her "imitative and artificial" early fiction and "turned to her own past and memories" to "discover there a heritage of female creativity and self-expression" was she free to write the books that were in her.

O'Brien ends the biography shortly after the successful appearance of *O Pioneers!*—a rather radical book in its suggestion that the frontier world believed to be exclusively male territory was also an arena in which strong, self-confident women could emerge triumphant ("The first time I walked off on my own feet—everything before was half real and half imitation of writers whom I admired"). Our final glimpse is of a Willa Cather newly empowered, motivated, confident, working away at *The Song of the Lark*, ready to assume her place in a man's world—and unashamed to enter it as a woman.

Bruce Allen
Literary critic

Architecture Anyone? Cautionary Tales of the Building Art
Ada Louise Huxtable
Random House, $27.50

Ada Louise Huxtable, architecture critic for the *New York Times* from 1963 to 1982, was, when she began her career, the "first and only" full-time architecture

critic for an American newspaper. Others had written about the subject before for various periodicals (there was Lewis Mumford, writing in the *New Yorker*, for example), but until Mrs. Huxtable came along no one had given the art of architecture and the process of building continuous, prominent, day-to-day attention. Mrs. Huxtable has received more than 30 professional awards for her work and more than 25 honorary degrees. And when she left the "crisis-oriented, deadline-controlled" world of the *Times*, it was because she had been awarded a long-term grant from the John D. and Catherine T. MacArthur Foundation—a grant that would enable her to spend more time on research and to pursue her interests independent of whether they happened to be newsworthy at the moment. From that opportunity has come, so far, her splendid book, *The Tall Building Artistically Reconsidered.*

Architecture Anyone? is a collection of Mrs. Huxtable's writing from her last several years at the *Times*—and the subtitle tells an important part of the story. Having been in a position to observe the high-stakes world of real estate development at close range for some time, Mrs. Huxtable acquired a certain cynicism. "The enormous amount of building and occasional work of architecture produced in New York through manipulations of money, law, politics, and morality make Machiavelli and the Medici look like simple country folk," she explains in her Introduction. Her work also took her around the United States and to Europe, where she encountered similiar admixtures of greed and insensitivity. And the titles of the pieces she wrote suggest some of the anger for which, in these last years, she became well known: "The Siege of Dublin," "Les Halles: The Death of the Heart," "Blowing it in Boston," "Selling Out the South Street Seaport," "Temptation of St. Bartholomew's," "Washington's Stillborn Behemoth" and so on.

It takes considerable interest and affection to expend that much anger, though, and Mrs. Huxtable's strong attachment to her subject is evident as well in her many essays of appreciation. There are words of praise for the works of numerous architects, living and dead: Richard Meier, John Hejduk, James Stirling, I. M. Pei, Robert Venturi, Alvar Aalto, Le Corbusier, Holabird and Root, Viollet-le-Duc. And our attention is called to an innovative example of council housing in London, that city's impressive body of turn-of-the-century architecture and Germany's successful and influential housing expositions (people are still living in Stuttgart's 1927 Weissenhofsiedlung). Also to the ways in which two very different shopping streets—Worth Avenue in Palm Beach and Madison Avenue in New York—provide visual interest that even the most extravagant shopping malls have never been able to match.

Mrs. Huxtable does tend to be at her best, though, when she has a bone to pick; it is then that her writing is most precise, most informative. In "Zoning: The End of the Line," she reminds us of the reason for the enactment of New York City's zoning laws in 1916 (the completion of a 40-story tower that covered its entire site and blocked so much sunlight that its neighbors were awarded property-tax reductions) and then traces the strange evolution of those laws that now unfortunately encourage exactly

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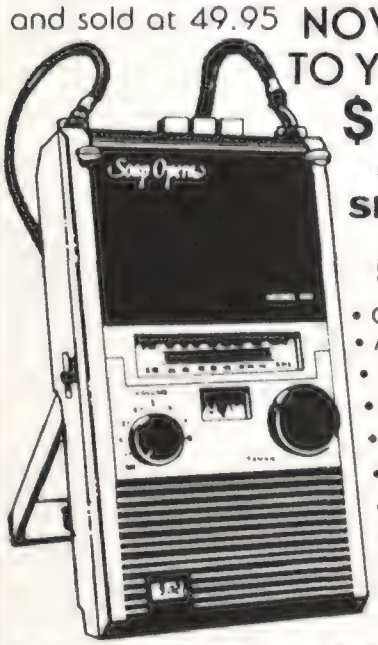

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the kind of building they were originally meant to prevent.

In "Lessons for the Eighties," one of several pieces on museum architecture, Mrs. Huxtable decries the way the administrative and curatorial staffs of Mies van der Rohe's National Gallery in West Berlin have ignored or subverted the Miesian esthetic—not only by means of unsympathetic installations but also by means of bad housekeeping; that is, by leaving the great expanses of glass unwashed. In that same piece, a discussion of why the Pompidou Center in Paris does work is much less exact; the reasons are left fairly vague. And while it is not completely uninteresting to learn that Mrs. Huxtable met her husband in Bloomingdale's or that she has gone to parties wearing "canary diamond" chandelier earrings from Woolworth's, some of the personal pieces and anecdotes really could have been left out.

Although some of the writing that appears in the book was done as long as ten years ago, the collection seems remarkably current—and not just because some minor updating has been done. A number of issues discussed here are ongoing (St. Bartholomew's) and some are renascent (Westway, Grand Central Station). In addition, Mrs. Huxtable's early analyses, which were astute, hold up very well over time. The book is likely to serve, in fact, as a very good preparation for understanding the architectural events and issues that will be important in the next several years.

Ellen Posner
Architecture critic, *Wall Street Journal*

Nature's Gambit: Child Prodigies and the Development of Human Potential
David Henry Feldman
with Lynn T. Goldsmith
Basic Books, $19.95

A child begins to speak in short but complete sentences at 3 months of age. By 2, he is studying French, Italian, Sanskrit and Hebrew.

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These are among six extraordinary children studied by psychologist David Feldman and research associate Lynn Goldsmith in order to unravel some of the secrets of the ancient phenomenon of the prodigy. Originally, a prodigy was a "monstrosity; something out of the usual course of nature, like a comet or a meteor," and prodigies were regarded as heralds of change. Historically, as now, prodigies have been viewed as deviants from natural order, and hence have elicited our fascination, awe and, sometimes, fear.

It may be, however, that they are very much a part of the natural order of things. The authors of this thoughtful, constantly surprising study contend that prodigies are an elegant "gambit" of nature: the object of the game being to increase the variety of forms in which human potential expresses itself, thus increasing the overall chances of survival of the species. Specifically, Feldman and Goldsmith maintain that by producing highly specialized individuals such as prodigies, as well as people with more generalized capabilities, nature has both hedged its bets and set the stage for extraordinary leaps forward in human development and evolution.

If we can understand how and why prodigies develop, the authors believe, we may learn how talent in larger numbers of people can be developed. A prodigy, for purposes of this study, was defined as a child who possesses a talent in any one particular, intellectually demanding field and who performs at an adult level before the age of 10. A prodigy may or may not go on to produce a work of genius. As the tutor of a British math prodigy told her: "You are not a genius until you have left your personal mark on your subject."

The six young children selected for study were accomplished in chess, math, languages, writing or music. The authors traced their development for ten years through interviews and observations that encompassed their families and teachers as well as the children. The results have been drawn together to illuminate some factors that contribute to the making of a prodigy. In essence what Feldman and Goldsmith saw was "a beautifully choreographed co-incidence of forces."

First, of course, is the appearance of an especially talented child. A second force is the accumulation of knowledge in the field of the child's talent to a propitious point. Would a mind like Einstein's, for instance, have made as great a contribution in the time of Galileo? Or would Mozart, born in Mendelssohn's time, have transformed music or just left his imprint on it? The third force is the culture: the cultural atmosphere must be receptive, with importance attached to mastery in a given field. Consider the well-organized system

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Solution to cipher on page 138

This is a sample of ordinary English. But don't assume that all English must follow the letter-frequency counts. For instance, an author named Ernest Vincent Wright wrote a full-length novel titled *Gadsby* without using the letter E a single time. This incredible feat has not been duplicated. To appreciate Wright's achievement, try writing a note to a friend without using the letter E.

the Soviet Union provides to support mastery in chess, while in this country a chess master may have trouble earning a living.

The evolutionary context "within which all other aspects of the prodigy phenomenon play themselves out" is the fourth factor and the one that forms the backdrop for the other three.

The single most constant catalyst the authors found was the family of a prodigy. Families must be able to recognize talent and able to support its development. One need not have a prodigy at hand to benefit from the experiences of the six families. Dedicated and ambitious, but not driving, they provided continual, imaginative attention, from special instruction and activities to monitoring the child's progress, offering emotional backing and noting the signs that a change in teachers or program was needed. The families proceeded largely on their own, for there are few specific rules for bringing out a child's potential. It is an art.

The first full-length study of prodigies to appear in a number of years, *Nature's Gambit* delves into most aspects of prodigy development. One may wonder—and someday we may understand—why these unusual children appear more often in fields such as musical performance and chess than in the visual arts (rarely) and mathematics (achievement seldom occurs before the age of 10). The mystical associations made with prodigies are gently probed, as well as the emotional issues such children have to face and a variety of reasons for which a prodigy may fail to live up to early expectations.

True to their own predictions, the authors find child prodigies rare, elusive flowers indeed, and it is fitting somehow that the children themselves get the last word. Three of the children altered their original courses: the linguist began composing symphonies; the child composer is now a rising violinist; and the writer composes rock operas and plays the guitar. After a decade of work, Feldman and Goldsmith conclude that while much has been understood, "we will have to observe many more prodigies over their lifetimes to approach an adequate explanation."

One caveat: reading this book takes determination, but those who persevere through the rather turgid prose will be rewarded for their effort.

Carol Eron
Author of *The Virus that Ate Cannibals*

Additional reading

Giant telescopes (p. 40)

Astronomy Through the Telescope by Richard Learner, Van Nostrand Reinhold, 1981

"The New Art of Telescope Making" by M. Mitchell Waldrop, *Science*, December 19, 1986

"Astronomy from the Ground Up" by Sandra Blakeslee, *Mosaic*, Summer 1986

Jacob Lawrence (p. 56)

Jacob Lawrence, American Painter by Ellen Harkins Wheat, University of Washington Press, 1986

Six Black Masters of American Art by Romare Bearden and Harry Henderson, Doubleday, 1972

Jacob Lawrence by Milton W. Brown, Whitney Museum of Art, 1974

Harriet and the Promised Land by Jacob Lawrence, Windmill Books, 1968

Indianapolis (p. 70)

"Star of Snow Belt: Indianapolis Thrives on Partnership of City, Business, Philanthropy" by Frederick C. Klein, *Wall Street Journal*, July 14, 1982

"A Rust-Belt Relic's New Shine" by Frank Maier, *Newsweek*, September 9, 1985

"'India-no-place' No More" by Jacob V. Lamar jr., *Time*, June 11, 1984

"Indiana capital finally finds itself" by M. W. Newman, *Chicago Sun-Times*, September 19, 1985

"Why amateur sports is trekking to 'Naptown,' U.S.A." by Steve Goldstein, *Philadelphia Inquirer*, November 11, 1984

Dinosaurs (p. 84)

Dinosaurs Past and Present, Vol. I (exhibition catalog and symposium proceedings), edited by Sylvia J. Czerkas and Everett C. Olson, Natural History Museum of Los Angeles County, 1987

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The Riddle of the Dinosaur by John Noble Wilford, Knopf, 1985

The Dinosaur Heresies: New Theories Unlocking the Mystery of the Dinosaurs and Their Extinction by Robert T. Bakker, Morrow, 1986

Dinosaurs, Mammoths, and Cavemen—The Art of Charles R. Knight by Sylvia Massey Czerkas and Donald F. Glut, Dutton, 1982

Mont Blanc (p. 92)

The First Ascent of Mont Blanc by T. Graham Brown and Gavin de Beer, Oxford University Press, 1957

Mont Blanc: An Anthology by Claire Eliane Engel, Rand McNally, 1965

Savage Snows: The Story of Mont Blanc by Walt Unsworth, Hodder & Stoughton (London), 1986

The Annals of Mont Blanc by Charles Edward Mathews, L. C. Page (Boston), 1900

Au Royaume du Mont Blanc by Paul Payot, Denoël (Geneva), 1978

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Exotic Plant Pests and North American Agriculture, edited by Charles L. Wilson and Charles L. Graham, Academic Press, 1983

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"APHIS: Guarding America's Bounty, APHIS Facts," APHIS, USDA, 1986

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"The Plant Protection & Quarantine Story of Miami, Florida, FY-1984," APHIS, USDA, 1985

Codebreakers (p. 128)

The Codebreakers: The Story of Secret Writing by David Kahn, Macmillan, 1967

The Shakespearean Ciphers Examined by William F. and Elizebeth S. Friedman, Cambridge University Press, 1957

The Man Who Broke Purple by Ronald Clark, Little, Brown, 1977

Machine Cryptography and Modern Cryptanalysis by Cipher A. Deavours and Louis Kruh, Artech House (Dedham, Massachusetts), 1985

The Index of Coincidence and Its Applications in Cryptography by William F. Friedman (Riverbank Publications, Vol. 3), Aegean Park Press (Laguna Hills, California), 1979

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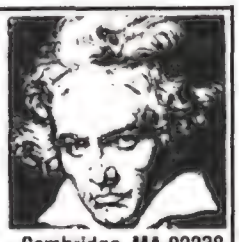

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Smithsonian highlights

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Extended summer hours

Five Smithsonian museums on the Mall will have extended summer hours from Memorial Day through Labor Day weekend (May 23-September 7): NMAH, NMNH and HM&SG will be open daily from 10 A.M. to 7:30 P.M.; the Castle daily 9 A.M. to 7:30 P.M.; and NASM daily from 10 A.M. to 9 P.M.

The National Zoological Park will have its own summer schedule. Through September 15, the Zoo grounds will open at 8 A.M. and close at 8 P.M., and the buildings will open at 9 A.M. and close at 6 P.M. daily.

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Special June exhibits and events

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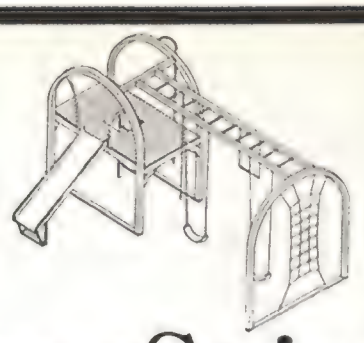

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National Portrait Gallery
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National Museum of American Art
Treasures from the National Museum of American Art (through July 19) Works from Colonial to contemporary times.

Cooper-Hewitt Museum (New York)
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Dinosaurs, Mammoths, and Cavemen, The Art of Charles R. Knight (June 4-August 31) Works by the great depicter of dinosaurs and prehistoric environments.
Dinosaurs Past and Present (June 4-August 31) Comprehensive collection of paintings, sculptures and models of the lordly reptiles. See page 84.

National Air and Space Museum
Into the Sunlit Splendor (June 19-December 31) Forty paintings by aviation artist William S. Phillips.

Renwick Gallery
Dan Dailey: Glass, 1972-1987 (June 26-October 25) See *Highlights continued.*
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Smithsonian World: "The Promise of the Land," June 10, 8 P.M., PBS channels.

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Resident Associate Program

To become a Resident Associate, or for fee and ticket information, call 357-3030. Here are some June events:
Leningrad Dixieland Jazz Band (June 14; 7:30 P.M.) First Washington appearance by renowned Soviet musicians.
Rhythm and Blues: The Orioles and The Jewels (June 12; 7 P.M.) Two groups perform black music of the 1950s and '60s.
Thomas Cole: A Waking Dream (June 19; 7 P.M. and June 20; 3 P.M.) Multimedia journey through the painter's life.
Artificial Reality: Interactive Video (June 29; 8 P.M.) Stunning computer simulations.

Smithsonian Institution Traveling Exhibition Service

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Atlanta (June 6-August 23) *Eleanor Roosevelt: First Person Singular*, Carter Presidential Library.
Longmont, Colorado (June 6-July 5) *Images of Old Age in America*, Longmont Museum.
San Diego (June 20-August 2) *Mouton Rothschild: Paintings for the Labels*, San Diego Museum of Art.

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Highlights continued

At the Renwick: Dan Dailey

In creations that both delight the eye and tantalize the memory, an artist melds old and new with subtle alchemy

"I have always tried," says glass sculptor Dan Dailey, looking back on 15 years' work, "to move beyond the boundaries of tradition." His one-man show demonstrates the vision, at once penetrating and eclectic, that the artist brings to an ancient and exacting art.

With an inventiveness and range that defy categorization, Dailey has produced vases and wall reliefs, sculptures, lamps and tripod assemblies—offbeat creations stamped with his wry sensibility and skilled draftsman's sureness of touch.

Early in his career, Dailey began shaping hand-blown glass vases. Artifacts of every era—ancient Greek, pre-Columbian, Egyptian—captivated his imagination, inspiring a series of vessels that invest a classical form with contemporary grace and whimsicality.

Dailey continues to draw on and transform diverse sources, from industrial design to cartoons. He crafts objects that offer a droll reading on the popular culture. The show, organized by the Philadelphia Colleges of the Arts, runs June 26-October 25.

Kathleen M. Burke

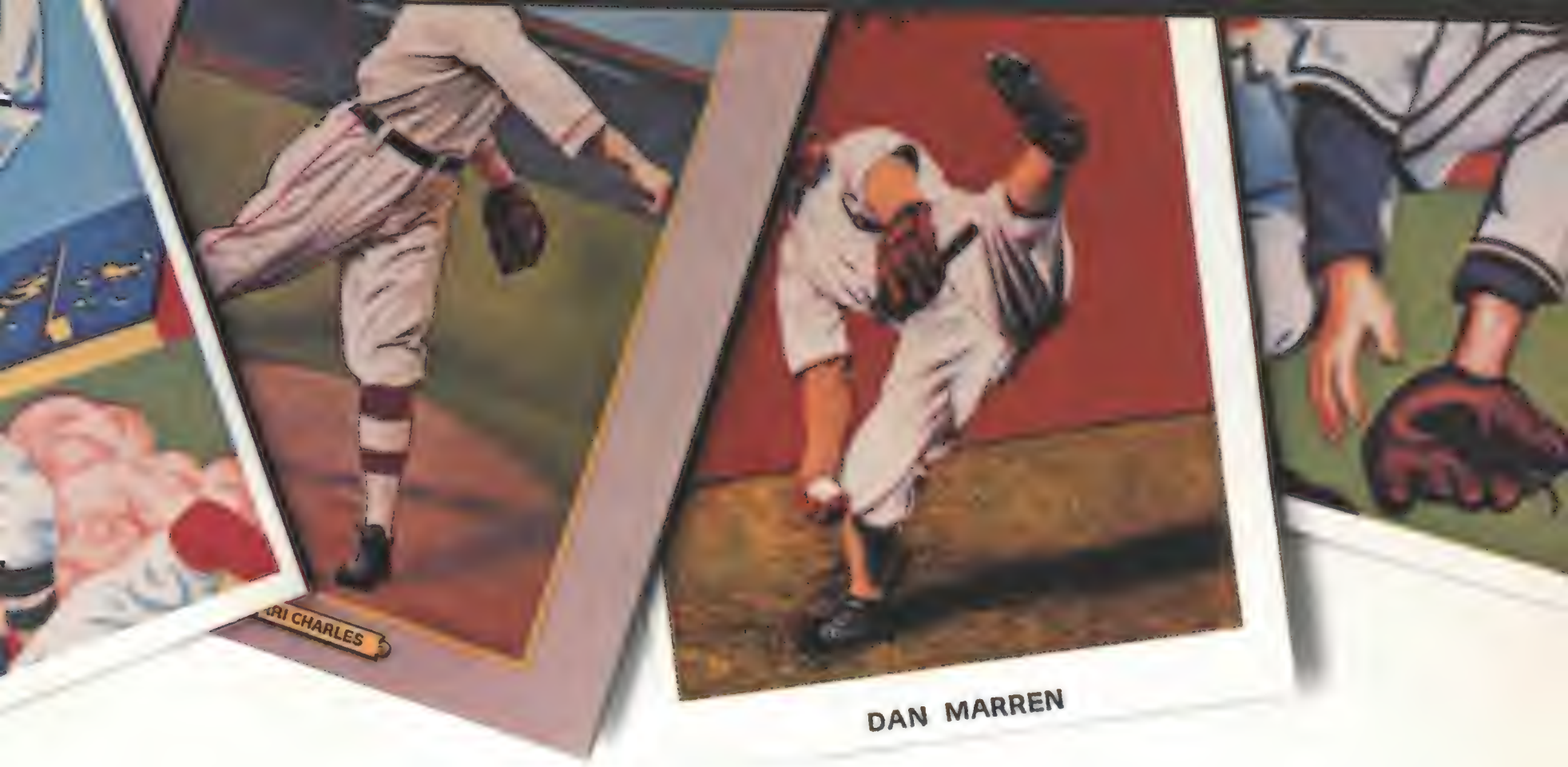
Gift of Gab captures the exuberance of two confirmed chatterboxes.

Shaped with surreal distortion, *Warriors* is a vase etched with stylized heads.

Fatigue, made of cut plate glass, began, like many Dailey pieces, as a drawing.

In jaunty *Etrus*, artist patterned nubbing on tripod vessels after medieval steins.

The Principles of Decor spoofs a material couple at home in a material world.



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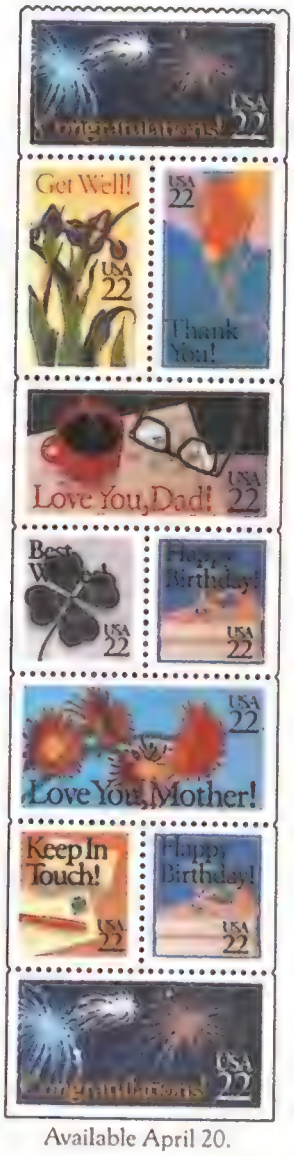

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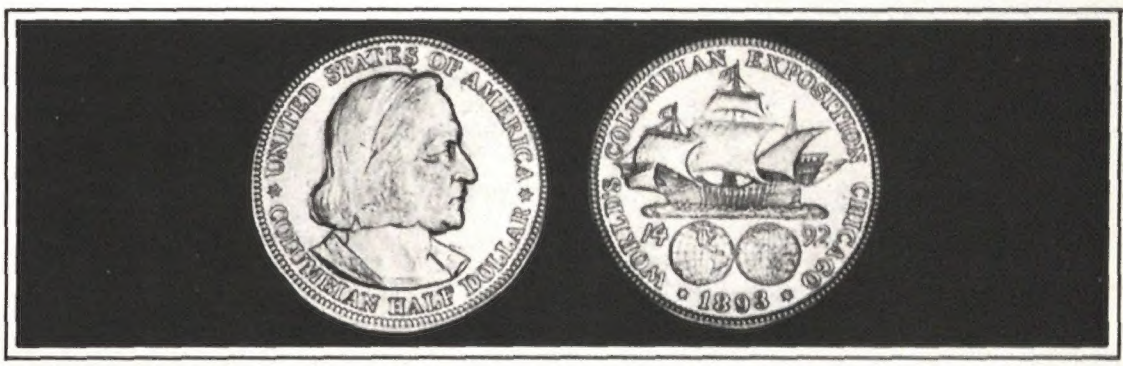

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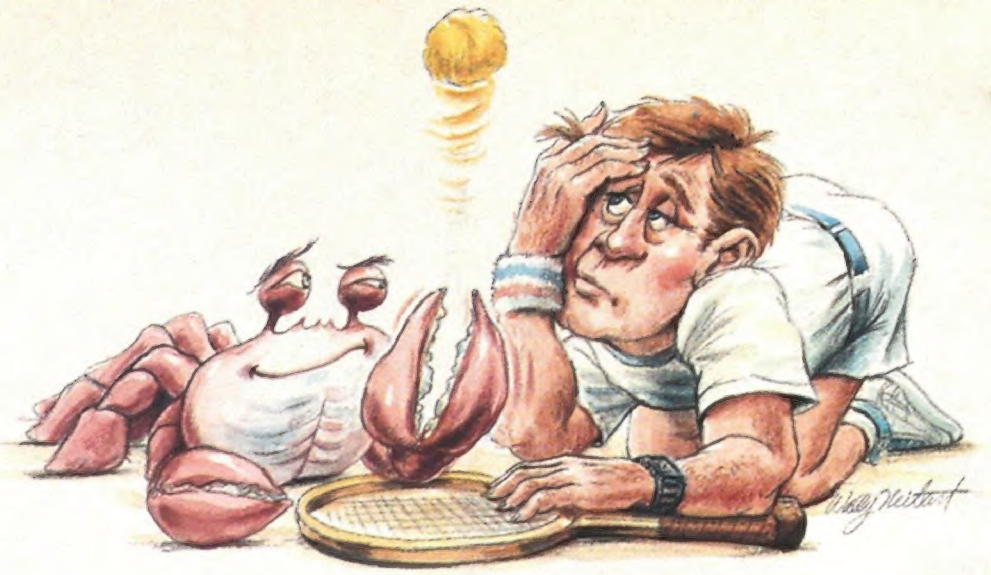
By Donald Dale Jackson

Who can serve better, Crabs or Scorpios?



When I missed an easy volley on the tennis court not long ago, my friend Beamish explained that my problem was astrological. "You're a Cancer, right?" he asked, as if nothing more need be said. "Cancerians lose the thread of a point, they wander off. And they lack a killer instinct." Beamish whirled and walked away in his cocksure manner.

This struck me as a pretty heavy load to pile on a botched shot that I was inclined to blame on natural incompetence aggravated by immobility, but it started me thinking. Do some astrological signs have better first serves than others? Is there something about being a Scorpio that makes Beamish's lobs so diabolically effective? Are some doubles teams better than others because they're astrologically compatible? Marriages made in heaven, so to speak?

As the match progressed, I began to view our thrusts and stumbles and fitful spurts of adequacy in a new light. When Cosgrove failed to run all out for a drop shot it was because he was a Pisces and prone to dally; when Finster whacked an overhead so hard it hit the fence on the fly it clearly demonstrated the overaggressiveness of your average Leo. My piffling second serve testified to Cancerian gracelessness under pressure.

I suppose that my opinion of astrology is a little short of halfway along the path between scorn at one end and superstition at the other. But tennis is too important to trifle with. So I read a book on what Cancerians are supposedly like. The Cancerian personality portrayed was not a pretty sight. We are a moody and petulant lot, it seems; also lazy, weak, oversuspicious and hard to get along with.

"It is infuriating to argue with a Cancer who simply keeps sidestepping or obscuring the issue," the book says. "Some Cancerians are not to be trusted when under fire...." But why go on?

It seems that there is some slight hope for us if only we evolve into the very best Cancerians we can be. Then we become, well, modesty precludes—no, you have a right to know: we become imaginative, sensitive, tenacious, nurturing, perceptive and (I especially like this) the best fathers in the whole swinging zodiac. It didn't say anything about losing the thread of a hard-fought tennis point or lacking a killer instinct.

For a week or so after reading the book I walked around in a Cancerian funk. I brooded and pitied myself and flared dramatically when anyone attempted to console me. The book didn't seem to hold out much hope for my marriage either; it sounded as if Cancer-Capricorn unions are all but doomed. "Capricorn is meant to achieve certain things and is capable of sacrificing a lot to achieve them," according to the text. "You [that's you, you Cancerian nerd] could be one of them." That suggested my wife might be willing to dump me in order to achieve something important, like reducing the federal deficit.

Just when I had all but abandoned hope for both the marriage and my forehand volley, I stumbled on *Biography Almanac.* It listed famous and successful people by the dates of their birth.

Here was a godsend, a potential lifesaver for a Cancerian in full slide. But the early entries were not encouraging. You remember Vidkun Quisling? Born on July 18, just like me. All he did was betray his native Norway to the Nazis and become a synonym for treason.

A 17th-century English physicist named Robert Hooke, another of the July 18 brigade, sounded promising until I read in the encyclopedia that he "originated much, but perfected little." Some kind of dilettante in the lab, that Hooke, never saw things through. The 18th-century Italian composer Giovanni Bononcini, another birthday mate, wrote several acclaimed operas but had to leave England in disgrace after trying to palm off another composer's madrigal as his own. I never did *that*, no matter what you've heard. These are my moonmates we're talking about, my astrological soul brothers. In their glories lay my hope. But where were the glories?

When it got to the 20th century, the July 18 roster really picked up. *Now* we were getting somewhere. Dick Button, the Olympic figure skater, Yevgeny Yevtushenko, the Russian poet. John Glenn. Okay, so there was also S.I. Hayakawa, and Harriet Nelson of *Ozzie and Harriet,* but John Glenn! Tenley Albright, another American skating champion, born on the same day and year. She's a doctor now, I know. But how's her old killer instinct? Can she hit a volley?

It was athletes I was really after. One Wimbledon champion on the July 18 list would do a lot for my second serve. I knew Arthur Ashe and Virginia Wade were Cancerians, but if a tennis player of that caliber were born on the same *day* as I was, what an impression *that* would make on Beamish. But no. Joe Torre, baseball player and manager. Calvin Peete and Bruce Lietzke, both of them fine golfers. But not a single tennis player.

We played again a couple of days ago. I told the group about my astrological researches, and mentioned a few of the imposing names that shared my birth date. Our signs merely indicated our latent potentialities, I explained to Beamish; we still worked out our destinies on our own. In short, I could volley as well as any bloody Aquarius or Taurus. Beamish, the ever-calculating Scorpio, wore his customary foxy expression. When I double-faulted a minute later he shouted, "You serve just like Quisling!" Then I missed a backhand down the line.

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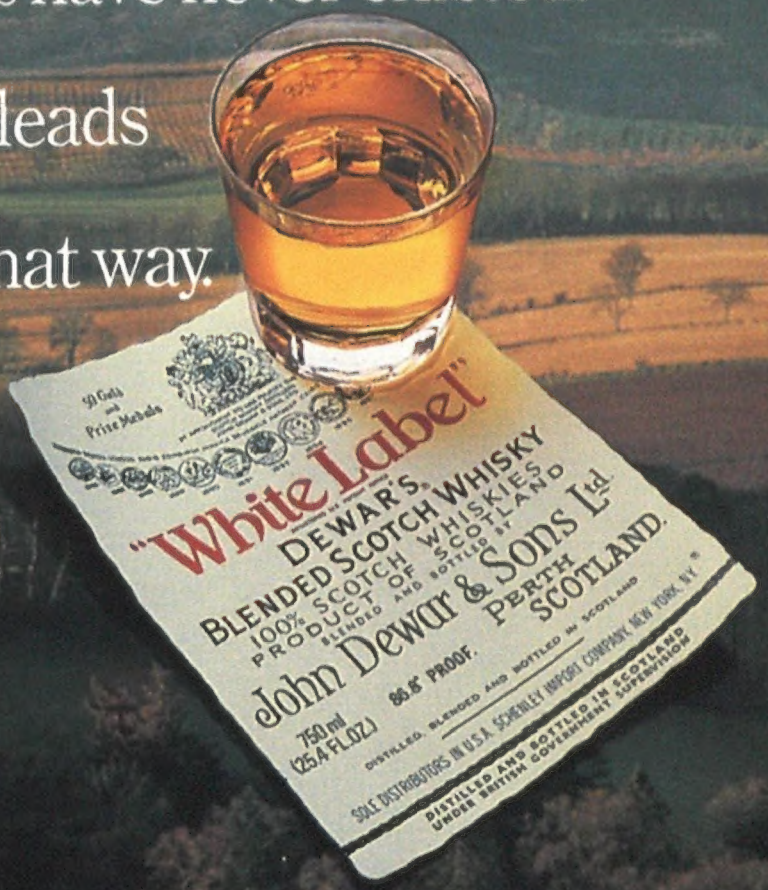

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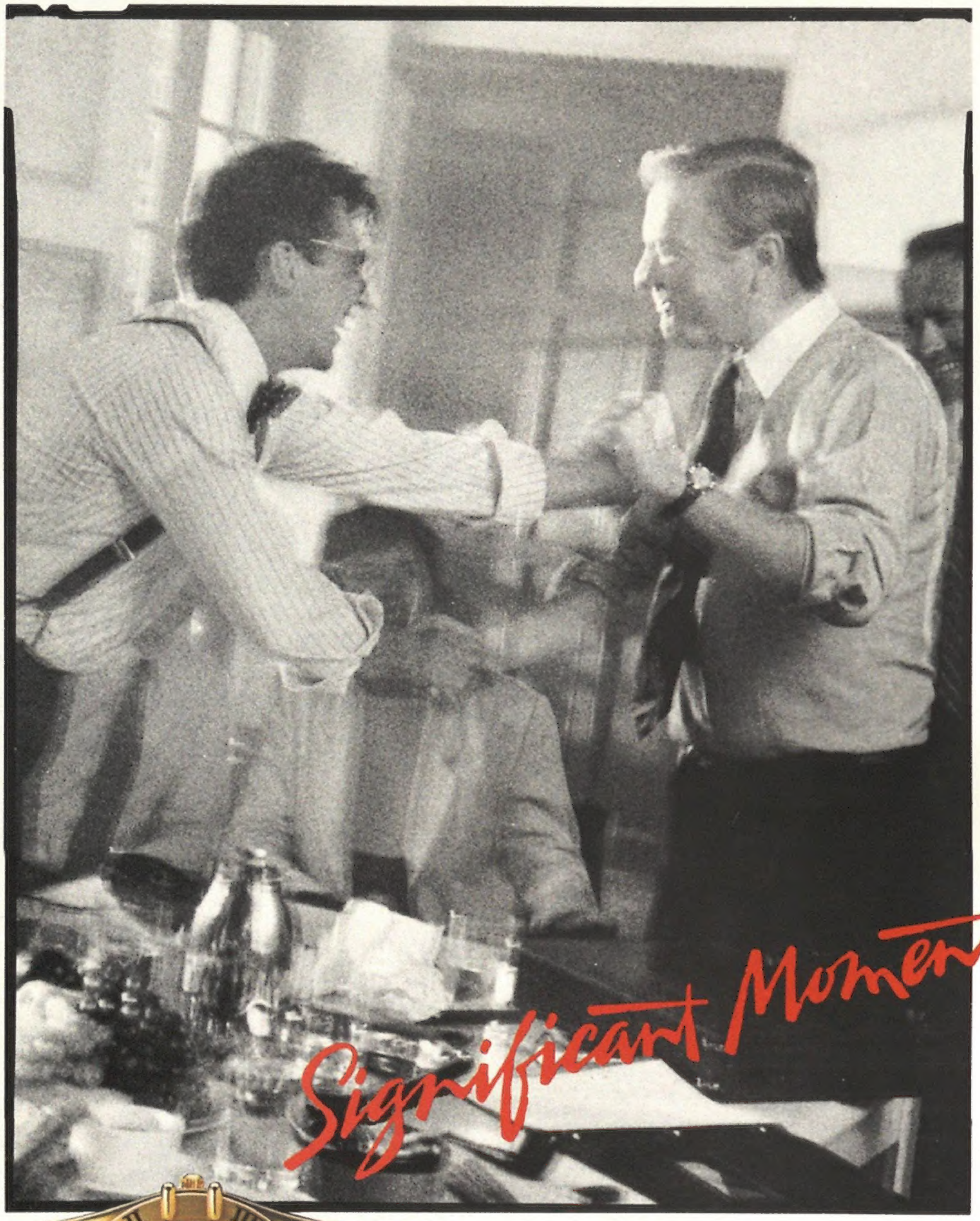

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